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MEDICAL AND SURGICAL REPORT

OF THE

PRESBYTERIAN HOSPITAL

IN THE

CITY OF NEW YORK

VOLUME IV
JANUARY, 1900

EDITED BY

ANDREW J. McCOSH, M.D.
W. GILMAN THOMPSON, M.D.

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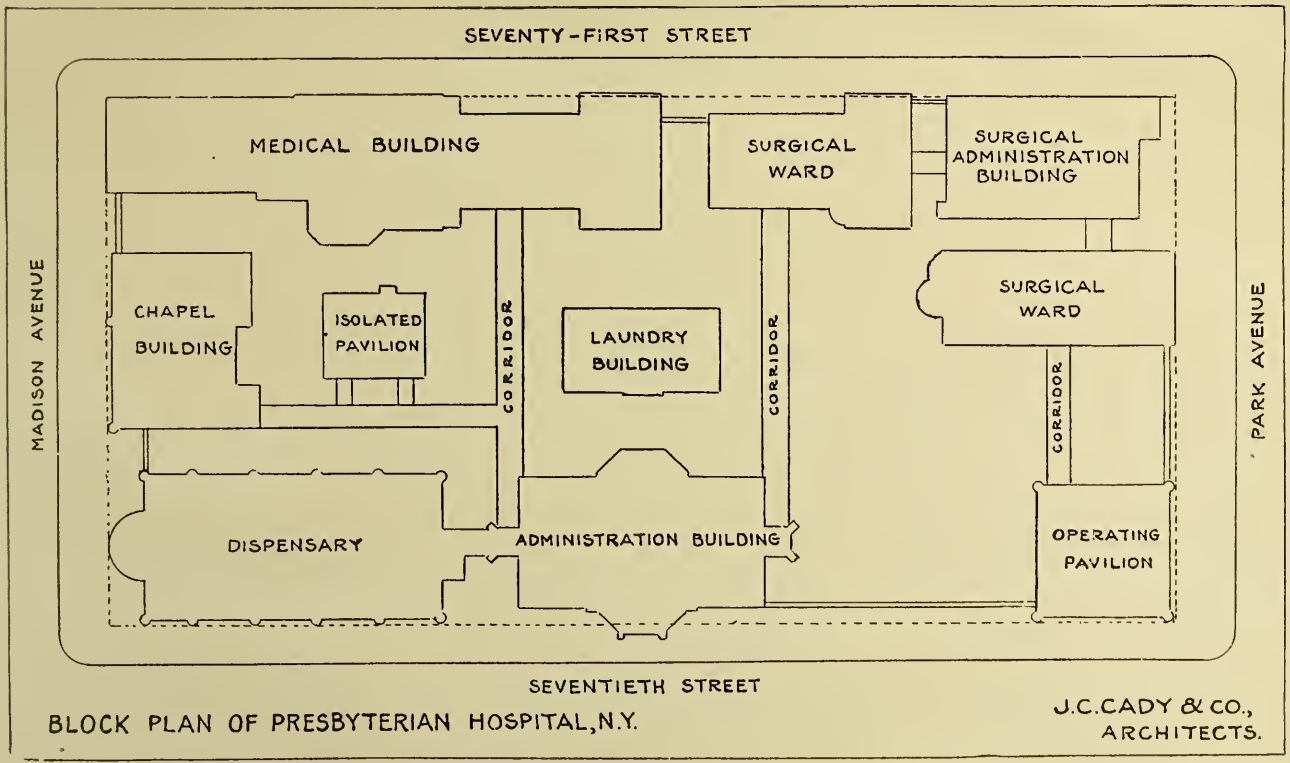

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EDITED BY
ANDREW J. McCOSH, M.D.
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I.

THE SURGICAL TREATMENT OF ASCITES DUE TO CIRRHOSIS OF THE LIVER. THE RESULTS IN CASES PUBLISHED TO DATE.

By F. Tilden Brown, M.D.

The following pages present a review of a rather recent acquisition to surgery, whereby a simple and rational operation offers chances for the permanent cure of a commonly fatal complication of liver cirrhosis, viz., ascites. My only excuse for broaching this subject so shortly after its presentation by Dr. Weir, in a paper read before the Practitioners' Society and printed in the *Medical Record* of February 4, 1899, is that six newly published cases can be cited, and because I wish to report a promising case operated upon more than six months ago.

For this so-called acquisition, surgery has apparently to thank a medical brother, Professor Talma, of Utrecht, and he probably derived some of this inspiration from the results obtained by a few workers in experimental physiological chemistry, especially those in St. Petersburg, where Eck, in 1877, made the first recorded trials to produce in dogs, permanent anastomoses between the inferior vena cava and the portal vein. Eck's experiments appeared in a Russian publication of 1877 or 1878, which bears the title, as translated into German, by Hahn, *Journal für Kriegsmedicin*. This my translator has not been able to consult. But Hahn and his co-workers, Massen, Hencki, and Pawlow, in the same laboratory of the Royal Institute for Experimental Medicine, tell us that Eck's eight animals died nearly immediately, with one exception, and this one disappearing, could not be studied. Their own article, "Die Eck'sche Fistel zwischen der unteren Hohlvene und der Pfortader und ihre Folgen für den Organismus," was published 1893.*

In this we learn that as Eck's experiments did not clear up the

* Archiv für experiment. Path. und Pharmak.

question as to whether such operations are not necessarily directly opposed to a continuation of life for the animal, Massen and Parlow repeated the experiments in their surgical and clinical range, while Hahn and Nencke studied the results from the stand-point of physiological chemistry.

Of some sixty dogs operated on, only about twenty survived, wound complications and thrombosis at the region of the anastomosis being the chief causes of death.

Of the animals surviving they noted at once a great difference in the behavior and health of the dogs which were meat-fed and those which were not. The former had convulsions, commonly followed by death, while the animals which received no meat did not have convulsions. They concluded that dogs having an Eck's fistula, by which there was a direct transmission of blood coming from the alimentary canal to mingle with the systemic blood in the vena cava without the filtration influence of the liver, are unable to digest meats without suffering some nervous disturbances, which are often followed by death. In the urine of these dogs they found the presence of carbamin acid, sometimes in large proportions. Then making experiments with this substance in healthy dogs they came to the conclusion that the acid is neutralized by the liver, being changed during transit of this organ into an indifferent body. In fine, that under normal circumstances one function of the liver is to change carbamin acid into urea.

In 1892, a year before the appearance of this paper of Hahn's just reviewed, a Dr. Thomas Lens published, in a Hollandish paper, an article entitled "Fastening of the Omentum Majus to the Abdominal Wall in Cirrhosis Hepatitis Atrophica," in which he states that Professor Talma, of Utrecht, deserves all credit for suggesting that surgical aid be given in cases of cirrhosis of the liver to help Sappey's accessory portal circulation when repeated collections of ascitic fluid show that this anastomozing system is unable to relieve the stasis.

In speaking about the earliest recorded case of any such operation for the relief of ascites, Lens says (writing in 1892), "The first case happened about three years ago and was operated on by Dr. Van-der-Meulen. The second case was operated on by Dr. Schelkly in the spring of last year (1891). The first patient lived only several hours after operation and died probably from shock. The second

case, about fourteen days after operation, removed the bandages in an attack of delirium tremens, by so doing infected the wound, and died of peritonitis." The author says it was communicated to him from a reliable source that in the second case a plain caput medusæ was already developed before death. Dr. Lens's own case was a male negro of sixty-one years, and was operated on in the Military Hospital in Paramaribo on June 6, 1891. The man had a cirrhotic liver with ascites. His abdomen was opened to the right of the umbilicus and after the fluid had been evacuated the lower edge of the omentum was sewn to this edge of the abdominal wound. The patient recovered from the operation and lived six months, but the ascites seems not to have been influenced; for tapping was again necessary five times before death.

Autopsy showed that vascularized adhesions had developed at the site of the operation.

We are next to consider the four cases of Dr. Drummond and Mr. Rutherford Morison,* who by two successful cases, by the technique they have advanced for the operation, and by the general conservative tone of their papers on this subject, have probably done as much to interest the medical mind and to advance the operation as any of the few writers. We have only to take exception to Mr. Morison's claim of operative priority, which is conveyed by his words in the *Lancet*† of May 27, 1899, page 1427, as follows:

"In another case I have performed the operation for the cure of ascites, and though the case is of no value in forming an estimate of the worth of the method, I think it is right to report it, as the introducer of a new operation should be expected to offer the whole of his experience concerning it."

Dr. Drummond's and Mr. Morison's first case was a woman, aged forty-two. Early in 1893, swelling of her feet and legs was noticed. A few months later the abdomen became distended with fluid. Between May and August, paracentesis abdominalis was performed forty-eight times.

On August 30, 1894, Mr. Morison opened the abdomen between the umbilicus and symphisis pubis. The liver was found enlarged,

* A Case of Ascites Due to Cirrhosis of the Liver. Cured by Operation. The British Medical Journal, September 19, 1896, p. 728.

† Cure of Ascites Due to Liver Cirrhosis by Operation. Lancet, May 27, 1899, p. 1426.

pale, smooth on the surface, and not harder than normal. The other abdominal viscera appeared to be normal.

Suture of the omentum to the anterior parietal peritoneum was done and part of the wound left open for a drainage-tube, which was removed at the end of fourteen days. Between that time and her death she was again tapped sixty-nine times. No post-mortem examination could be obtained. The authors then speak of this case as inappropriate for this operation, not being one of ascites due to cirrhosis of the liver, and in a later paper (*Lancet*, May 27, 1899) they reiterate this conviction.

Their second case concerned a woman, aged thirty-nine, with a decided alcoholic history, who, early in 1895, suffered with jaundice and gastric disturbances, and then had a general peripheral neuritis. Abdominal distention came on, and within four months of the commencement of her illness tapping was necessary. During the next four months paracentesis was required four times. She was rapidly losing weight and strength.

On October 22, 1895, the abdomen was opened below the umbilicus and emptied of fluid. The liver was inspected and found to be typically cirrhotic. The abdominal cavity was dried with sponges and the parietal peritoneum scrubbed with a sponge. The peritoneal covering of the liver and the spleen and the portions of parietal peritoneum opposed to them were specially scrubbed. The omentum was sutured across the anterior abdominal wall, a glass tube was left in the pouch of Douglas and the parietal wound was closed with silk sutures. Then, for the purpose of retaining the parietal in contact with the visceral peritoneum, long broad adhesive straps were firmly applied circularly from the epigastrium down to the tube in the hypogastrium. Three weeks after the operation there was no fluid escaping and the drainage-tube was removed. A few days later the wound had entirely healed and the patient went home. She soon regained health and led a happy, busy life. Eight months later she was shown at the Medical Section of the British Medical Association, and the only fault to be noted in her general health was a threatening ventral hernia at the point of operation, due to a persistent cough and imperfect suturing.

The subsequent history of this case is interesting. Two years after the operation the abdominal belt had ceased to be a sufficient support for her ventral hernia. She was anxious to have the rupt-

ure radically cured. With this end in view, Dr. Drummond operated on October 5, 1897, by a method of his own, wholly extraperitoneal. The evening of the same day the patient became very restless and complained of pricking pains and numbness in her arms and legs. The next morning she was distinctly jaundiced and the subjective symptoms already complained of were intensified. The second day after the operation she became comatose and died. Although our curiosity is not gratified as to the cause of death, and besides we are not informed as to what anæsthetic was used during the operation, the following interesting demonstration of the results of the former operation were derived from the post-mortem examination.

"At the autopsy the whole of the abdominal viscera and the parietes were removed *en masse*, excepting the skin. This entire section was then injected from the trunk of the portal vein, by which we were enabled to see that the liver, the spleen, and the intestines were attached to the parietes chiefly by numerous band-like adhesions. Many of those seemed to contain little except a blood-vessel, and in several of them such vessel was four inches in length. The omentum, firmly adherent over the anterior abdominal wall, showed innumerable injected vessels passing from the omentum and viscera to the parietes. Many of them were the size of a normal radial artery. . . . The spleen was at least four times its normal size."

The authors add, "It is quite evident that the obstructed portal circulation has nothing to do with splenic enlargement—in this case at all events—for here the new anastomotic circulation was clearly more than sufficient to compensate for any diminution in size of the portal vein."

The third case reported by the same authors was a man of forty-two years, who claimed to be of temperate habit. He had had three attacks of pneumonia on the left side. All the signs of a large collection of free fluid in the abdomen were present. No liver dulness could be distinguished. The spleen was immensely enlarged. Dr. Drummond was asked to examine the patient. . . . He concluded that the ascites and enlarged spleen were due to liver cirrhosis.

Operation, January 12, 1897; chloroform.—Two incisions were made, a large one above the umbilicus and a small one below for

drainage. The liver showed the usual appearances found in alcoholic cirrhosis. The spleen was at least six times its natural size. The same technique was followed as in two previous cases, except that the large incision was in this case above the umbilicus and a small one, only large enough for a drainage-tube, made below. The glass drainage-tube was frequently emptied of serum by a pump. The amount collected for the first ten hours after operation amounted to eight ounces and four drachms. During the next twenty-four hours the amount was six ounces and six drachms. Two days later the quantity had dropped to four ounces.

The india-rubber tube which supplanted the glass one was finally withdrawn on the twelfth day after the operation, and two days later the patient went home.

The general recovery of the patient was apparently complete at the end of two years, when he was about to be accepted as a first-class risk by a Life Insurance Company.

Of special interest, however, in the case, as bearing on the experiments of Eck and Hahn *et al.*, was that just before going home and for the following three weeks the patient exhibited much mental depression, alternating with occasional periods of excitement.

In connection with this experience Morison refers to a patient of Dr. Drummond's who manifested peculiar nervous symptoms and died. Necropsy failed to show any changes in the nervous system, but the liver was in an advanced stage of cirrhosis; while there was no ascites, there was found a very large vein of Sappey connecting the portal with the systemic circulation. Dr. Drummond's explanation of the attacks was that blood, laden with intestinal products, found too open and direct an entrance into the systemic circulation without sufficient liver function being brought to bear on it.

Their fourth case concerned a woman, aged fifty-four, who had an enormously enlarged fluctuating abdomen and great swelling of the legs. She had some albumin in the urine.

Operation, March 6, 1897.—Paracentesis gave four and a half gallons of ascitic fluid, but no appreciable difference was noted in the size of the abdomen. A huge multilocular cyst of the left ovary explained the situation and had to be removed. As the liver was seen to be cirrhotic and the spleen and omental vessels enlarged, a relieving peritoneal anastomotic circulation was indicated and pro-

vision sought for it by suturing the omentum across the anterior abdominal wall.

The patient did remarkably well for a week, then became lethargic; later the pulse was intermittent, steadily failed, and she died on the eleventh day after operation. A limited post-mortem examination led the operator to believe that the advanced cirrhotic condition of both kidneys was the cause of death.

In reporting this case the authors admit that it is rarer to find uncomplicated cases of liver cirrhosis and ascites than they had thought, and when such complications as valvular heart-lesions, thoracic aneurism, albuminuria and glycosuria occur they should contra-indicate operation because of their permanency.

Dr. Weir's case * was a male aged thirty-nine; admitted to the Medical Division of the New York Hospital October 29, 1898, with a history of marked alcoholism. For the past two years he had noted increasing size of the abdomen, and later was conscious of being jaundiced. Five months later, in August, 1898, paracentesis gave ten litres of ascitic fluid. From then until October 31, 1898, he required nearly weekly tappings. During this time he had lost twenty-five pounds. Liver dulness was on the nipple-line in the fifth space and extended to three and a half inches below the ribs. The spleen was about twice the normal size. Heart normal. The urine had a specific gravity of 1016, and contained a few faintly granular casts but no albumin. Diagnosis, hypertrophic cirrhosis of the liver and portal obstruction. Dr. Samuel W. Lambert gave a bad prognosis and transferred the patient to the Surgical Division of Dr. Weir, who, on November 4, 1898, made the following operation under nitrous oxide gas and ether anæsthesia. A four-inch vertical incision was made on the right side of the upper third of the rectus muscle, its sheath opened and the muscle strongly pulled to the left, when the posterior sheath with the peritoneum was divided. The omentum, though quite small, was thicker than usual and filled with unusually distended veins. The sharp point of a steel hat-pin was used to scrape the opposing surfaces of the right lobe of the liver and diaphragm, as well as the parietal peritoneum adjoining the wound. When the blood-ooze resulting from this had been arrested the omentum was stitched with six or eight points of catgut on each

* On Re-establishing Surgically the Interrupted Portal Circulation in Cirrhosis of the Liver. Medical Record, February 4, 1899, p. 149.

side of the wound, which latter was closed. A small one-inch suprapubic opening was made to admit a double perforated glass drainage-tube behind the bladder. To this was subsequently attached a Cathcart's permanent syphon attachment. The patient did fairly well for three days. On the fourth his pulse rose and he complained of much pain in the lower abdomen. He became somnolent, with decreasing urine; pulse, 104–120; temperature, 99° F., and never exceeding 100°, and he died on the fifth day, not having vomited and having had but little distention. Autopsy showed that quite an extensive peritonitis prevailed, most intense in the pelvis. Infection was inferred to have occurred through the drainage-tube, although the pin scratches on the liver surface are alluded to by the operator as having possibly liberated colon bacilli. Again the echinococcic cysts found at necropsy in the right lobe of the liver may have had to do with the infection.

Talma, of Utrecht, in 1898 published a paper entitled "Surgical Opening of New Side-tracks for the Blood of the Vena Porta," wherein the author states that in 1896 he had an opportunity to test his views regarding the possibility of permanent relief of ascites, in a case of liver cirrhosis, by operation. His patient was a boy of nine years, with a large liver and spleen, hypertrophied heart and ascites, besides showing œdema of the lungs, legs, hands, and face. The urine contained methæmoglobin and a large percentage of albumin. Later acute parenchymatous and glomerulo-nephritis was evident.

Several paracenteses were done, the ascites quickly recurring.

On March 7, 1896, he requested surgeon von Eiselsberg to open the abdomen in the region of the lower border of the right lobe of the liver and to attach the gall-bladder and omentum by suture to the anterior abdominal wall about the inner margins of the wound.

Nine days after operation the wound had closed; there was now little liquid in the abdomen; good-sized veins, running upward into the intercostal spaces, were seen. The amount of albumin in the urine had greatly diminished.

As the great enlargement of the spleen was considered to be the result of a venous stasis, Talma believed the adhesion of the spleen to the abdominal wall was desirable and indicated. He requested Professor Narath to effect this by an incision along the region of the spleen and to fasten this organ to the abdominal wall. The wound

did not heal primarily. After severe suppuration and final closure of the wound the spleen was greatly diminished in size. A month later the patient was discharged apparently cured. Twenty months later he was in good health. The liver was still hypertrophied and very hard. The spleen was 11½ ctm. wide and 19½ ctm. long.

In the splenic region thick veins were to be seen reaching upward over the thorax, and still more ran downward toward the crural vein.

Although in his paper, Talma voices the clinical experiences and the post-mortem observations of many other writers on cirrhosis of the liver, the fact that he appreciated the possibilities of surgical aid and actually employed it in one of these cases makes it reasonable to believe that a brief review of parts of his article will not be without interest.

"Atrophic cirrhosis may take place without giving rise to morbid symptoms as ascites or icterus.

"It may be accompanied by ascites as the only symptom and then the development of a collateral circulation will bring about a cure or improvement. I propose to my confrères to open new tracts for this circulation in suitable cases. The indication for the operation is an obstruction to the passage of the blood of the vena portæ through the liver. Good function of the liver-cells is necessary for obtaining good results from the operation.

"The cause of the obstruction may exist either in the liver or in the transverse fissure. Such obstruction may be recognized by the presence of ascites and swelling of the spleen and other known symptoms, but the diagnosis is difficult. Whether the ascites is due to peritonitis serosa or to cirrhosis of the liver is hard to decide as

"1. The product of a peritonitis serosa can be a fluid of a specific gravity less than 1014 and contain a small number of leucocytes.

"2. In peritonitis the fluid returns slower, but where the liquid results from increased pressure in small veins and capillaries it returns quickly. But this is not a pathognomonic sign, as he had seen a case of peritonitis serosa where for six months the ascitic fluid returned with the greatest rapidity, and on the other hand there are cases of atrophic cirrhosis where the ascites disappeared after several tappings, ending in the development or enlargement of a collateral circulation.

"The next mistake can be made by accepting a secondary interstitial hepatitis, a peritonitis serosa, as a primary cirrhosis of the liver."

In order to avoid mistakes the best diagnostic aid is to *see* the peritoneum. But sometimes the process in this is limited to a very small space.

Other points in aid of the diagnosis may be œsophageal, gastric, or intestinal hemorrhages, but all of these can occur from other causes.

The presence of some impediment to liver-circulation may reasonably be inferred if there is present a caput medusæ, but this is seldom noted, and on the other hand a disturbance of liver circulation may exist without the visible presence of a caput medusæ, as in cases where a very much enlarged vein in the suspensory ligament transports a good deal of blood from the vena portæ to the abdominal wall, thence to the crural and intercostal veins, without enlarging the veins visible through the skin.

As to the diagnosis of atrophic cirrhosis of the liver, it is also hard to make, since we know that a liver with a secondary atrophy may be larger than a normal liver, and therefore it may be stated that the size of the organ does not suffice to make a diagnosis of primary cirrhosis.

Other symptoms may help one to arrive at a diagnosis of cirrhosis, but it must be remembered that the existence of functional changes in the liver-cells impairs the utility of the operation, and that the presence of uro-bilinuria, icterus, acholic or hypocholic stools, xanthoma, and other forms of skin pigmentation, are more or less important contra-indications to the operation.

Neumann, in a recent article,* says that Talma's paper urged him to perform the operation in November, 1898. After reviewing the pathology of endothelial adhesions and the varying causes which at times lead to highly vascularized adhesions and again to adhesions but slightly vascularized, he gives the following data regarding his own case: A woman of alcoholic history, forty-five years old, with no jaundice and no fever, presented an abdomen distended with ascites; the liver was hypertrophied, hard and smooth. The spleen was enlarged.

The urine contained some albumin. No mention is made of any former paracentesis having been necessary.

Operation, November 2, 1898.—After evacuation of the fluid the

* Alfred Egon Neumann, Zur Frage der Operationen Behandlung des Ascites bei Lebercirrhose. Deutsche Med. Woch., Vol. 25, 1899, p. 422.

great omentum was adjusted to the wall and tucked in when closing the wound. No drainage. Ten days later union per primam. Several full veins were seen near the umbilicus and slight ascites was found.

On January 2, 1899, the patient was gaining flesh. Liver smaller by measurement; no ascites; urine normal; well-developed veins about umbilicus.

After disputing the conclusions arrived at by Tillman and others who explained their ability to ligate the portal vein without causing an animal's death to the fact that newly developed anastomotic vessels had begun to form immediately upon completion of a foregoing operation where suture of peritoneal surfaces had been effected, Neumann concludes that whatever the proper explanation may be we are justified in trying Talma's operation on human beings, always having in mind Talma's main requirement, viz.: that the liver-cells be not too greatly impaired in their functional capacities, and that every precaution should be taken in selecting proper cases in order not to permit discredit to fall upon so valuable an operation.

Two cases recently reported in the *Lancet*,* by Dr. H. D. Rolleston and Mr. G. R. Turner are as follows:

The first was a man, aged forty-five, with a moderate alcoholic and pretty positive syphilitic history. He was admitted on June 22, 1899, to St. George's Hospital with the story of having vomited about three quarts of blood in the previous forty-eight hours.

Spleen enlargement was distinct. Change in the size of the liver was not noticeable. The patient was treated for hæmatemesis due to cirrhosis.

Three weeks later œdema of the feet and ascites appeared. Laparotomy for the institution of artificial adhesions between the liver and parietal peritoneum was acceptable to the patient. On July 31, sixteen pints of ascitic fluid were withdrawn in the morning and in the afternoon a five-inch incision was made parallel to the costal border. The liver was markedly hob-nailed, but was free from adhesions. The opposing surfaces of diaphragm and liver as far as they could be reached on both sides of the suspensory ligaments were scraped with finger-nail, sponge, and director. A kangaroo

* On the Surgical Treatment of the Ascites of Cirrhosis by the Artificial Production of Peritoneal Adhesions. By Dr. H. D. Rolleston and Mr. G. R. Turner. The Lancet, December 16, 1899, p. 1660.

tendon was passed through the edge of the liver, the omentum, and the cut parietal peritoneum; and the three structures were tied together so as to bring the omentum up between the liver and the diaphragm. The rest of the wound was closed in layers.

The patient steadily improved after the operation and left the hospital in less than a month. He was seen three and a half months later. His condition is described as much improved, but there was still a trace of ascites and some œdema of the feet.

The second case was a man, fifty-two years old, admitted to same hospital on June 21, 1899. For four months the patient had had morning vomiting; for two months the amount of urine had been scanty; there was an alcoholic history. Ascites had been noticed for two months, and œdema of the feet for two weeks. Four days after admission, eighteen pints of ascitic fluid were withdrawn. A rather rapid reaccumulation of fluid led Mr. Turner to operate on July 14, through a vertical incision in the right semi-lunar line. The liver was markedly cirrhosed. The finger-nail was used as before in conjunction with a sponge and director to scratch opposing surfaces of peritoneum. The margin of the liver was fixed to the abdominal wall by a kangaroo-tendon suture and the superficial wound closed throughout.

The patient recovered well from the operation, but twelve days later there was so much ascitic fluid present that paracentesis was required. The fluid was now turbid from the presence of numerous leucocytes. In less than two months following paracentesis was necessary five times, and six weeks later reports showed the patient confined to bed and deteriorating. In reviewing their technique of operation these authors are disposed to maintain advantages for it over that practised by others. We cannot agree with them at all, but on the contrary see every reason to believe that the finger-nail is not a suitable utensil for scratching the peritoneal surfaces, and think that had supra-pubic drainage been provided for in the second case, together with adhesive-plaster compression of the upper abdominal zones, as had already been indicated by Mr. Morison, the result would have been different.

The case we have to report gives the following history:

J. C.; male; forty-three years old; laborer. Was at three different times a patient in the Presbyterian Hospital.

At the time of his first admission, July, 1898, he complained of

indigestion, occasional vomiting, some dyspnœa, and a gradually increasing enlargement of the abdomen, besides swelling of the ankles and feet. The patient's history showed no syphilitic, tuberculous, or rheumatic disease.

He has been an habitual user of alcohol for many years, chiefly in the form of whiskey.

Abdominal paracentesis relieved the symptoms and his general condition improving he left the hospital on the following September. He was able to work for several weeks. There was a gradual recurrence of his former symptoms and he again entered the hospital March 27, 1899. Repeated attacks of diarrhœa had troubled him all winter.

Physical examination at this time showed an abdomen moderately distended; tympanitic in the epigastric, hypochondriac, and umbilical regions, dull in lumbar and hypogastric. Fluid wave appreciable. Edge of liver not palpable. Splenic edge not palpable because of abdominal distention, but the area of percussion dulness is increased. Stomach tympany reaches as high as the upper border of the fourth rib. The superficial veins of the abdomen are more distended than usual. There is a slight cyanosis of the lower extremities. Circumference of abdomen at the umbilicus is thirty-seven inches.

Thorax.—Heart apex not appreciable by inspection or palpation, apparently in the fourth space just within the nipple-line.

Second sound slightly accentuated. There is moderate icteroid tinge of the face and conjunctivæ.

Lungs.—Negative over the right; left gives dulness posteriorly over the lower fourth, and with slight feebleness of respiration-murmur. Pulse is of low tension, without thickening of the vessel-walls. He was treated for eleven days with diuretics and became salivated. As during this time his circumference had decreased but a little over half an inch, paracentesis was resorted to on April 10, and he was discharged improved on April 28, 1899.

He worked during one week, when his symptoms rapidly reappeared, and he was readmitted to the hospital on May 31, 1898. His abdomen is more distended than at any previous time, besides having œdema of the scrotum and lower extremities. The urine contained albumin and casts. There was some endocardial trouble. Circumference at the umbilicus, thirty-nine inches.

Abdominal paracentesis was performed on June 1, 1899, 356 ounces; June 14, 333 ounces; June 23, 323 ounces; July 5, 392 ounces; July 18, 337 ounces; July 27, 347 ounces; August 10, 397 ounces; August 20, 381 ounces. Total quantity in seven weeks was 2,866 ounces.

The man was rapidly losing. He was so well aware of his hopeless state that the proposal of the attending physician, Dr. Tuttle, to be transferred to the Surgical Division for operation was accepted.

On September 1 measurement of the abdomen showed forty-one inches.

Operation, September 2, 1899.—Chloroform; asepsis. A five-inch incision was made between the ensiform and umbilicus, and a two-inch incision above the symphysis. On evacuation of ascitic fluid the omentum was seen to be small, shrivelled, and lumpy. The veins were large and tense. The lower margin of the omentum reached to the umbilicus, where it was adherent to the parietal peritoneum. The round ligament was the size of a finger and hard. The liver was hard and small. On its surface were the characteristic hob-nail lesions. The spleen was thought to be more than twice its normal size. The convexities of the liver and spleen as well as the peritoneal surfaces opposed to them were vigorously rubbed with dry gauze sponges grasped in metal holders. The parietal peritoneum fronting the omentum was treated in the same way before suturing these tunics with chromicized catgut. There was but one transverse line of eight or ten sutures. The layers of this upper abdominal wound were individually closed in the usual way.

Through the lower wound an inch and a quarter diameter glass-tube was passed into the pelvis behind the bladder. Capillary drainage was provided for by sterile gauze led through the tube. Adhesive straps half encircling the trunk were drawn over the upper dressing from the ensiform to the umbilicus. Vomiting was troublesome for the forty-eight hours after operation. Champagne was serviceable.

The large gauze and cotton dressings had frequently to be changed; the bed was sometimes wet from the serous overflow. At each change a syringe passed into the glass tube would generally remove six to eight ounces of serum. During the second week the quantity of ascitic fluid was much less. The upper wound had

healed per primam. Compression of the lower part of thorax and upper part of abdomen was continued for three months. On the twenty-third day the large glass-tube was changed for a smaller one. The patient at this date was sitting up in bed eating and digesting solid food for the first time in seven months. The abdomen at the umbilicus measures thirty-five inches.

October 10, the thirty-eighth day, drainage-tube removed. Patient out of bed. October 18, abdomen measures thirty-two and a half inches. November 1, both wounds closed, measurement thirty-two inches. Appetite good; bowels regular. Urine gives no evidence of albumin or casts.

At our request Dr. Tuttle has on January 5, 1900, kindly made a physical examination of the patient and reports as follows:

"I to-day examined J. C., with the following result:

"Patient well nourished. Color good. No jaundice. Chest somewhat barrel-shaped. Lower border of ribs somewhat everted and prominent superficial veins, prominent especially on right side.

"*Heart.*—Apex-beat neither visible nor palpable. Located by auscultation in 5th intercostal space, 3¾ inches to left of median line. Action regular and of moderate force. No murmurs.

"*Lungs.*—Percussion-note in front a little wooden in quality. Slight dulness over both bases behind. Breathing over both apices in front, a little roughened; rather feeble over both bases behind. Voice normal. No râles.

"*Abdomen.*—Not prominent. A moderate amount of superficial fat. Two linear scars in median line, one above and one below the umbilicus. Superficial veins not prominent. Percussion-note moderately tympanitic all over and decidedly tympanitic over epigastrium. A little dulness in both flanks, but no signs of fluid.

"Palpation shows an area of slightly greater resistance and an indefinite rather than soft mass in hypogastric region beneath and around the lower scar, apparently due to adhesions. There is nowhere any tenderness to pressure.

"*Liver.*—Dulness extends from fifth rib to near the costal margin. The edge cannot be felt.

"*Spleen.*—The area of dulness is increased. The edge is not felt.

"Extremities normal, with exception of some brown pigmentation over shins.

"The changes noted in comparing with examination in April, 1899, are: Heart apex has descended from fourth to fifth intercostal space. Liver dulness begins at fifth instead of fourth rib. The circumference of abdomen has diminished from thirty-seven inches to thirty-two inches, while the fat of the abdominal wall has decidedly increased.

"GEORGE A. TUTTLE, M.D."

Of the fourteen cases which are more or less fully reviewed in this paper, seven, or fifty per cent., appear to belong in the division headed greatly improved or cured.

		Greatly Improved or Cured.
Van der Meulen	1	
Schelkley	1	
Lens	1	
Drummond and Morison	4	2
Talma	1	1
Weir	1	
Rolleston and Turner	2	1
Bossouski	1	1
Neumann	1	1
Brown	1	1
	14	7

We feel assured that the great risks attending operation on advanced and failing cases of ascites due to cirrhosis will be notably wanting in similar procedures applied in earlier stages of the disease.

Some impressions derived from these reported cases and observation of our single patient may be summarized as follows, presuming of course that we are dealing with pretty straight cases of ascites due to cirrhosis of the liver:

1st. The more rapid have been the accumulations of ascitic fluid, the greater the reason to provide for long-continued drainage which is to follow the operation and to expect that very gradual improvement in all symptoms is the most and best which can be hoped for.

2d. In these advanced and apparently hopeless cases of rapidly recurring ascitic accumulation the three things of greatest import appear to be:

a. The full appreciation before operation of the necessity and the provision for a constant and thorough aseptic pelvic drainage.

b. The general observance of a rational and aseptic operative technique, such as that used in the third case of Mr. Morison, and which we followed quite closely in our case. In other words, the readiness to forego the introduction of personal innovations until those methods which appear reasonable shall have been proven faulty.

c. The value of Morison's adhesive strapping to keep in approximation the denuded peritoneal surfaces, and at the same time to compel the serous effusion to find its only available space in the pelvis, appears to us most evident. The importance of the long continuance of this device we had accentuated on two occasions, when a hospital interne attempted at the end of four weeks and again later to dispense with the adhesive strapping. Each time an accession of ascitic fluid to the upper part of the peritoneal cavity was apparent.

II.

A CASE OF DERMATITIS EXFOLIATIVA.

By George Thomas Jackson, M.D.

Margaret G., aged forty-six ; married ; born in Italy.

Previous History.—The patient has been married twenty-five years, and has had eight children, the fifth and sixth pregnancies having resulted in abortions. These were followed by the birth of two children at term that are still living. Three years ago, while in Italy, she says that she had a disease of the palms similar to that which she now has. For this she seemingly was given iodide of potassium, and used a "black plaster." It was cured in about three months. There was no evidence of any other skin disease or of syphilis in herself or her husband.

Condition, on October 27, 1897.—The patient was first seen by me at The Woman's Medical College of the New York Infirmary for Women and Children. She stated that the disease began about two months previously in the middle of the palms. Both palms were found to be affected. They were covered with psoriasis-like, white, glistening scales, with a well-defined bright-red margin extending upon the backs of the fingers to just below the second joint, where it ended in a point. The disease was symmetrical. There was some itching. Apart from the palms the body was free.

Subsequent History.—When first seen she was given diachylon ointment with five per cent. of salicylic acid.

November 13, 1897. She was given iodide of potassium in increasing doses.

November 20. The eruption was found to be spreading up on the backs of the fingers. She was taking fourteen drops of iodide of potassium and complained of pain in her stomach. The dose was reduced to ten drops, t.i.d., and so continued.

January 26, 1898. The eruption grew constantly worse. For the past month or six weeks she has been taking arsenic and using

FIG. 1.

FIG. 2.

FIG. 3.

ichthyol locally. The backs of both hands were now involved in the disease, and the hands were red and stiff. The arsenic was stopped as well as the ointment. She was given Startin's tonic and directed to soak her hands for an hour a day in a weak warm solution of bichloride of mercury, and to dress them with carbolated vaseline.

January 27. The hands looked and felt better. They were dark red, smooth, glazed, and every part was involved in the eruption except the tips of one or two fingers. The nails were brown, had lost their lustre, and had a sieved appearance. There was a papular eruption on the forearms. The skin was neither thickened nor cracked.

February 19. The disease was spreading on the flexor surface of both forearms as a continuous, red, dry eruption, covered with fine scales. There were a few lesions on the tips of the elbows, and on the anterior face of both knees, which were round and covered with thin scales. The patient was now presented to the New York Dermatological Society and the diagnosis of dermatitis exfoliativa or pityriasis rubra was concurred in. She then entered the Presbyterian Hospital. She remained in the hospital until July 15, 1898, and the following is a summary of the case as taken from the careful notes of the House Physician.

February 25. A papular eruption appeared on the scalp. She was using carron oil on her hands and skin.

March 12. The conditions are improved.

March 15. A new advance of the dermatitis occurred over both thighs and on the soles of both feet. A good deal of pain in the fingers was complained of. Boric-acid ointment was ordered for the feet, and carbolized vaseline for the rest of the body.

Through the month of April she was given small doses of opium and soda baths, with some improvement of the dermatitis on the body, but with no effect upon the hands. Toward the end of April she was put on fifteen-drop doses of a saturated solution of iodide of potassium, the soda baths were stopped, and her skin was oiled freely with a pure quality of olive oil. Marked improvement followed this plan of treatment, which was continuous. The dose of the iodide was now increased by three drops each day, and improvement was still more rapid.

June 9. The skin, excepting on the hands, was nearly normal,

and the hands were better. She was taking one hundred and eight grains of iodide per diem. It was directed to stop increasing the dose of the iodide.

June 28. All but the hands were well. They were still somewhat red and scaly. The nails were not so loose and tender as they previously were.

July 15. The patient was discharged from the hospital, there being only a little thickening of the palms, but no redness. For the past two weeks she had taken the iodide occasionally in small doses, and used one drachm of oil of cade to the ounce of olive oil, for the hands.

The last time I saw the patient was in October, 1898, when she was, to all appearances, absolutely well.

REPORT ON THE MORBID ANATOMY BY JOHN S. THACHER, M.D.

"The pieces of excised skin after hardening, measured about 3 mm. in diameter and 5 mm. in thickness. They were fixed and hardened in formalin and absolute alcohol, embedded in celloidin and stained with hæmatoxylin and eosin. Measurements of the sections which were successfully cut perpendicularly to the surface in parts where the structure appeared normal, showed a stratum corneum of a nearly uniform thickness of from 8 to 12 μ; no visible stratum lucidum; a well-marked stratum granulosum, consisting ordinarily of three rows of cells, and a Malpighian layer varying in thickness from 75 μ to 500 μ where the projections between the papillæ of the corium were deepest. On the surface of the specimen, covering an area of about 1 mm. in diameter, was a scaly thickening of the horny layer about 120 μ in thickness. In this area the epidermal cells were partly separated on the surface and at the border, and the edges of the superficial cells projected from the general mass. The nuclei of these cells were visible, faintly stained with hæmatoxylin. There were some cavities in this area where the cells had been pushed apart. In these cavities, and scattered among the cells of the epidermis of all the layers, were small, very dark blue bodies, varying in size from about 1 to 3 μ, round, sometimes a little irregular. Sometimes two of them were connected by a fine blue thread. They looked like the fragmented nuclei of an invasion of polynuclear leucocytes. Similar bodies and nuclei resembling those of lymphocytes were found in

Dermatitis Exfoliativa.

moderate abundance in the corium, along the blood-vessels, in the ducts of the sweat-glands, and in the hair-follicles."

Remarks.—This case is of interest on account of its rarity and its outcome. It is the second case of general exfoliative dermatitis that I have had in the hospital. The other one was secondary to eczema. The present one seemed to belong to the class of cases that are primary, and in which the prognosis is bad. Both of the patients fully recovered, and both improved when only the mildest kind of local treatment was used. The very prompt improvement in this case under iodide of potassium, when given in the hospital, leaves no doubt that it was a very important factor in the treatment. It was found that only a pure quality of olive oil was well borne by the patient. Cotton-seed oil, that frequent substitute for olive oil, invariably made the skin more inflamed.

III.

LARGE FIBRO-CYST OF UTERUS.

By Charles K. Briddon, M.D., and John S. Thacher, M.D.

C. S., aged forty-four ; native of Ireland ; widow, admitted to the Presbyterian Hospital, October 10, 1899. Family history is negative. Patient's general health has always been excellent and menstruation regular. She has had five children, each delivery being uncomplicated, and has never had a miscarriage. Her present illness began about three years ago, when she accidentally felt a small firm tumor in the lower portion of the epigastric region, unassociated with pain or tenderness. About one month later her whole abdomen began to grow large, and she commenced to have retching and nausea every day with frequent vomiting, vomitus consisting of mucus or sour fluid or both. These gastric symptoms continued for about two months and then disappeared. The abdominal swelling steadily and gradually increased until one year ago, and since then the abdomen has become more rapidly larger. One year ago, after unusual exertion, the patient noticed a small, firm, tender tumor low down in the left side of the abdomen, at first distinct from this epigastric swelling, but soon apparently becoming fused with it. During the past year her gastric symptoms, above referred to, have been exaggerated, and she has fallen away considerably in flesh, probably because of the prevalence of these symptoms. Her bowels have been no more constipated than formerly. She menstruated last from October 2 to October 9, ending on the latter date, the period being perfectly normal. One week ago, without apparent cause, her left lower extremity below the knee became inflamed, presenting characteristic symptoms of a mild phlebitis, which has incapacitated her up to the present time.

Physical Examination.—Patient is anæmic and poorly nourished.

Heart.—There is a faint systolic murmur at the apex ; both heart sounds are weak.

Lungs.—There are a few scattered râles; otherwise negative.

Liver.—Percusses from fifth rib to free margin, where dulness is lost in dulness of tumor.

The lower ribs on each side, and the ensiform are driven outward.

The abdomen is dome-shaped, and presents the caput Medusæ. There is flatness over the whole abdomen excepting in the flanks, where tympany exists over the ascending and descending colon. Flatness and tympany do not change with variation in the patient's position. The abdomen is more tense and resistant over the lower half, where there is an obscure sensation of a fluid wave. The intestines seem to be crowded into the epigastric and hypochondriac regions. The umbilicus is flat with the centre slightly projecting. The circumference of the abdomen at the umbilicus is forty-three inches. Vaginal examination reveals varicosities and œdema of the labia, especially upon the right side. The cervix is almost inaccessible, drawn high up and to the left. There are no tumors.

Extremities.—The left leg is œdematous, red and hot, and there are several large varicose veins upon it.

Up to the time of operation the pulse has remained under 90; the temperature has run from 99.5° to 101°. Urine has been negative.

Operation, October 18.—Anæsthetics, nitrous oxide and ether.

The patient was placed in the dorsal position. A four-inch incision was made in the median line of the abdomen, below the umbilicus and deepened between the recti muscles to the peritoneum. The recti were much thinned out and formed a layer about one-sixteenth of an inch thick. The anterior abdominal wall was everywhere adherent to the surface of the tumor; at some points the adhesions being dense, and separated by the hand of the operator only by the use of considerable force. This procedure required an extension of the incision upward to permit the necessary manipulations, the hand being introduced superiorly as high as the ensiform cartilage and laterally into either flank. A large trocar-canula was then plunged through the cyst-wall anteriorly, and about three gallons of dark-brown fluid of rather thin consistency and without odor were evacuated. The cyst-wall was then grasped and forcibly drawn out through the incision in the abdominal wall. The wall of the cyst was found intimately adherent to the omentum, with large blood-vessels coursing between the two structures. These adhesions were divided after the application of a chain ligature of

heavy catgut to the main mass of omentum, the large vessels having previously been ligated with catgut. The small and large intestines were everywhere adherent excepting posteriorly where over a small area coils of small intestine lay free and close against the cyst-wall. The adhesions to the intestines, which were of a very intimate character, were carefully separated, clamped off, and cut across; at some points these adhesions being so close that it was necessary to leave portions of the peritoneal surface of the cyst attached to the gut. With the freeing of adhesions, the mass of the tumor was drawn out of the wound, leaving behind only its pedicle, which was attached to the fundus of the uterus, being continuous with the uterine wall. The tumor was apparently a fibro-cyst. The elongated uterus was situated, with both tubes and ovaries, in the left iliac fossa, and was wholly without the pelvis. The tubes and ovaries were normal. At this point in the operation, the patient's pulse becoming weaker and as rapid as 140, she was given a saline infusion of 1500 c.c. with hypodermic stimulation by strychnine sulphate, gr. $\frac{1}{30}$, and nitro-glycerine, gr. $\frac{1}{100}$, the patient responding well under stimulation. Large clamps were then placed across both broad ligaments close to the vaginal vault. The uterus and its tumor, with ovaries and tubes, were then excised, the broad ligaments and uterine stump being tied off with heavy silk. Owing to the patient's condition no attempt was made to cover the raw surface of the uterine stump with a peritoneal flap. The general cavity of the peritoneum was flushed out with normal salt solution at a temperature of 120° F.; the edges of the abdominal wound approximated by interrupted sutures of silk-worm gut extending through the entire thickness of the abdominal wall, the cavity being left completely filled with salt solution. One piece of sterile gauze was placed in the lower portion of the wound, running down to the uterine stump, and the usual dressing was applied. The weight of tumor and fluid contents was thirty-nine pounds. At the conclusion of the operation the foot of the bed was elevated, hot-water bags were applied, and the patient was given stimulating enemata of hot salt solution and whiskey.

October 19. During the past eighteen hours the pulse has remained of fair quality, between 125 and 140. This morning the patient vomited several times a small amount of greenish fluid, and lavage was accordingly administered at twelve o'clock, considerable

fluid of a foul odor being returned through the tube. A short time later, about twenty hours after the operation, the pulse having become suddenly weaker, a saline infusion to the amount of 1250 c.c. (temperature, 115° F.) was given. One hour later the patient had a chill lasting twenty minutes, followed by a rise in temperature to 102.4°, the pulse becoming 172, and of still weaker quality at the wrist. As the patient was evidently going into collapse, 1200 c.c. of normal salt solution were administered by hypodermoclysis, this operation being followed by recovery from shock, the pulse becoming slower and more forcible.

October 20. The patient has continued steadily to improve, being troubled only at times by nausea, which, however, has not prevented the retention of small amounts of kumyss and champagne. Lavage was given at 10 P.M. and some unchanged champagne and kumyss, without bad odor, returned. Calomel (grains x.) was left in stomach.

October 21. The patient has had several movements of the bowels to-day, followed by an improvement in all the symptoms.

October 29. For the past three days the temperature has not been above 99.5°. The pulse has remained between 85 and 90.

November 1. The patient's temperature to-day rose abruptly to 102°; pulse became 116, respiration 24, the patient being nauseated and feeling miserable. These symptoms were followed by the development of an intra-abdominal abscess on the right side. The removal of stitches in the lower part of the wound, allowing free exit for the pus, was followed by a speedy disappearance of constitutional and local symptoms. Recovery was otherwise uneventful. The sinus at the lower angle of the wound speedily closed, and patient has been up and about for several weeks, her general health being completely restored.

Discharged, cured, November 29, 1899.

EXAMINATION OF THE SPECIMEN BY DR. JOHN S. THACHER, PATHOLOGIST.

Gross Appearances.—Attached directly to the fundus of the uterus and rising from it like a balloon is a hollow tumor, twelve inches in diameter. It is almost perfectly spherical, but the surface shows several low, rounded elevations and many remains of torn adhesions.

The uterus is flattened from before backward and measures $4\frac{1}{2} \times 3 \times \frac{3}{4}$ inches, not including the lower end, which was not removed from the patient. The Fallopian tubes are elongated. The ovaries are flattened and the right ovary is somewhat hypertrophied and contains a small cyst.

The area of attachment of tumor to uterus measures $2\frac{1}{4} \times \frac{3}{4}$ inches, and occupies the left anterior portion of the fundus, the beginning of the left Fallopian tube lying directly behind it. The tumor is sessile, expanding at once from its attachment to the uterus without any stem.

A single cavity occupies almost the entire tumor. In the wall are a few secondary cavities. The wall varies greatly in thickness. A large part of it is from $\frac{1}{16}$ to $\frac{1}{8}$ inch thick, but there are many uneven thickenings, up to two inches in depth, made of firm, white and pale yellow tissue, some of them containing small cystic cavities. A considerable part of the floor of the cyst, that is the portion adjacent to the uterus, consists of such dense masses, of irregular outline and uneven surface. The thickenings in other parts of the wall are more even in shape, like flattened spheroidal masses. Much of the cyst lining is quite smooth, but in other parts, especially over the thickened floor, it is rough, and some coarse tags hang into the cavity.

Microscopical Appearances. — The tissues consist principally of coarse even bands of connective tissue. These appear faintly fibrillated, homogeneous and stain well with eosin. Some of them are seen on cross sections to be hollow and the small lumen to be lined or filled by a few small cells. Between these bands are crowds of small cells, round and angular, with small, oval, deeply staining nuclei. There are a few small areas of smooth muscle. In some parts the tissues show, by their faint staining and granular, structureless appearance, that they are necrotic, and there is some blood extravasated into the tissues, especially into the necrotic tissues near the inner surface of some of the thicker parts of the wall. No cellular covering of the inner surface could be made out. The fluid which filled the cyst was not saved for examination, but is said to have been thin and of a pale reddish-brown color, somewhat like weak tea.

The growth evidently belongs to the group of uterine tumors called fibro-cystic. But under that name are recognized several varieties of tumors, originating in different ways and named and

looked upon as so many kinds of growths. Uterine tumors containing considerable cavities may develop in the following ways:

1. By dilatation of the proper uterine cavity, as in hydramnion, cystic moles, hæmatometra, etc.

2. By dilatation of remains of fœtal channels in the uterine wall, as of Gärtner's duct.

3. By simple but marked dilatation of the lymph-spaces and lymph-channels of a fibromyoma, that is an œdema of high degree.

4. By hyperplasia and dilatation of the lymph-channels of a fibromyoma, the "fibromyoma lymphangiectodes" of Leopold.

5. By hyperplasia and dilatation of the blood-vessels of a fibromyoma, the "myoma telangiectodis cavernosum" of Virchow.

6. By hemorrhage into a fibromyoma.

7. By necrosis of parts of a fibromyoma.

8. By myxomatous change in a fibromyoma.

9. By sarcomatous change in fibromyomata associated with changes similar to those already named (3–8).

Of these many varieties of cystic uterine tumors the first two stand clearly apart both in nature and in appearance. The simple uterine dilatation (1) is easily recognized from its gross anatomy. The second group, arising from the dilatation of such fœtal channels as Gärtner's duct, can generally be recognized by the simple cystic appearance and the ciliated epithelium which lines the cavity, but the remaining varieties, which compose the fibro-cystic tumors of the uterus, seem to be distinguished from each other not so much by characteristic peculiarities constituting them different kinds of growths as by the predominance of one or more features which may be present in greater or less degree in any of the varieties and are often seen variously combined. Hyperplasia and distention of lymph-vessels and blood-vessels, hemorrhage and necrosis, myxomatous and sarcomatous change, are all processes by which the uterine fibromyomata are liable to be affected. A well-marked sarcomatous change indicates, it is admitted, so important a variation in the nature of a growth that a tumor in which it is clearly made out deserves to stand in a category apart from the other fibromyomata; but to consider a predominance of necrosis or hemorrhage or enlargement of vessels as giving to a tumor a nature distinct from the others seems hardly a true view unless the predominant features are extreme. Excluding, then, the first two groups and also well-

marked sarcomata, the above classification should be looked upon not as insisting upon so many kinds of tumors but as enumerating the changes to which uterine fibromyomata are liable.

Leopold's description of the tumor removed by Fehling in 1875 (*Arch. für Gynaeh.*, vii., 1875, p. 531) was followed by a cordial welcome of the lymphangiectatic as a distinct kind of uterine fibro-cyst. And yet the fact that he found some of the smaller cavities lined with endothelium seems hardly to have justified him in proposing this new name in this case, for lymph spaces lined with endothelium are probably present in all fibroids, and moreover there was in his case a large cavity with irregular and necrotic walls. Nor do we feel sure that all the uterine tumors reported as sarcomata have been properly so called. It is a very difficult matter to say when the smaller cells of a fibromyoma are so numerous and so uniform as to place the tumor among the sarcomata.

In view, then, of the lack of essential differences as well as of sharp dividing lines between the various groups of uterine fibro-cysts it seems hardly proper to label our specimen more definitely than "a fibro-cyst of the uterus," noting, however, the features which are prominent. It is evidently a fibromyoma in which a large cavity has been formed and some small cavities. That necrosis has been an agent in this cyst-formation is evident from the considerable extent of that process discernible in the sections and from the raggedness of parts of the inner surface. That hemorrhage has assisted in enlarging the principal cavity appears probable from the hemorrhages seen in the tissues and from the color of the contained fluid. That an accumulation of lymph has further distended the cysts seems at least possible from the character of the fluid and the smooth lining of a considerable part of the wall.

IV.

TUBERCULAR DEGENERATION OF THE PATENT URACHUS IN THE ADULT.

By Charles K. Briddon, M.D., and Ellsworth Eliot, Jr., M.D.

R. M., aged nineteen ; Roumania ; married ; admitted July 17, 1899. No tubercular family or personal history. The patient has always been well until five weeks ago, when she began to have slight pain, with heat, redness, and swelling in the region of the umbilicus, the navel having previously been always normal in appearance. The symptoms increased for two weeks, at the end of which time there was a small red tumor, the size of a pea, in the region of the umbilicus. During this time the patient suffered intensely from severe, sharp pain, almost constantly present, in the hypogastric region, with well-marked vesical tenesmus, increased frequency of micturition (often voiding urine every hour) and occasionally small amounts of blood in the urine. At the end of the two weeks the swelling opened spontaneously, discharging some cloudy fluid, with uriniferous and foul odor, the pain and swelling soon subsiding. About four days after the discharge of fluid at the umbilicus she ceased to pass water normally, and since then has had a constant discharge of cloudy fluid, of uriniferous odor, at times slightly blood-stained, through the opening at the umbilicus. She has lost considerable flesh and strength during the period of five weeks.

Physical Examination.—The patient is markedly anæmic ; and is apathetic. The facies are flushed ; the tongue is moist and not heavily coated. The superficial glands are not enlarged. In the heart there is a hæmic murmur over the pulmonary area, systolic in time. Percussion of the lungs is normal, but the breathing is rather poor. The abdomen is soft, retracted, and no masses can be felt. At the inferior portion of the umbilicus is a small sinus with everted and ulcerated edges, which discharges a sero-purulent fluid of uriniferous odor. A probe introduced into the sinus goes downward and

extends evidently as far as the bladder. The bladder does not percuss high, but there is some tenderness on pressure over the suprapubic region. Urine analysis at the time of admission showed very turbid and cloudy urine, with specific gravity of 1014; fifteen per cent. of sediment; reaction strongly alkaline and odor foul and ammoniacal. There was ten per cent. of albumin; no blood, a large amount of mucus, much pus and many vesical cells, with many crystals of triple-phosphate. No casts were found. She was placed upon bladder irrigation twice daily, with warm one-half per cent. boric-acid solution, and salol (grains 5) three times a day. There was no improvement under this treatment, either in the character of the urine or in the patient's general condition, except that she had slightly less pain. At the end of a week the bladder irrigation was changed to carbolic acid, in strength of 1 to 120. This also seemed to have no effect upon the urine, frequent examinations up to the time of operation giving about the same result. As at the first analysis, the specific gravity never rose above 1014; the urine always remained alkaline and was full of pus and mucus. The temperature course was irregular, varying between 99.5° and 102° F., and did not seem to be influenced in any way by the bladder washing. During a period of several days of fairly constant low temperature, the patient gave a moderately characteristic tuberculine reaction. The average daily amount of urine voided by the urachus varied from fifteen to twenty ounces. At intervals of several days she voided a few drachms or an ounce of urine per urethram.

Owing to the obstinate, unyielding cystitis, it was thought advisable to do a suprapubic cystotomy for purposes of drainage.

Operation, August 25.—Dr. Eliot; nitrous oxide and ether; asepsis; dorsal position. A catheter was introduced through the urethra into the bladder and urine was withdrawn. Four ounces of warm one per cent. boric-acid solution were then gently thrown into the bladder by a fountain syringe; six ounces of water injected into a Barnes Dilator having been previously inserted into the rectum. A 2½-inch median incision was then made above the pubis and deepened down to the space of Retzius. The soft cellular tissue here being pushed aside, and the bladder presenting, two silk sutures were passed in a longitudinal fashion through its wall, separated by a distance of one inch, these sutures being placed for purposes of traction. The bladder was then opened between the silk sutures,

the boric-acid fluid pouring out into the wound. The incision in the bladder-wall being subsequently enlarged upward, disclosed the urachus opening into the fundus of the bladder. There were several small areas of ulceration on the posterior wall of the bladder, and parts of the ulcers, together with a portion of the urachus, were secured for microscopical examination. The ulcerated areas upon the bladder-wall were cauterized with a thermo-cautery. The lumen of the urachus was packed with a strip of iodoform gauze, the cavity of the bladder being drained through the suprapubic wound in the usual way, by means of a tube.

REPORT BY J. S. THACHER, PATHOLOGIST.

A. *Minute fragment of tissue from urachus.* Microscopical examination shows a mass of smooth muscle and connective tissue. The muscle-cells vary somewhat in size and shape, and are irregular in arrangement.

B. *Minute fragment from base of bladder.* The epithelium is partly destroyed and the tissues are much inflamed. The inflammation appears to be of some standing.

The bladder was drained very satisfactorily for ten days by the siphon drainage apparatus, the suprapubic wound remaining comparatively clean and dry. The patient's temperature was increased for six days following the operation. Recovery was uneventful. Bladder irrigation with carbolic acid, 1 to 40, was employed, when the drainage apparatus was dispensed with, the urine clearing up slightly and pain becoming much less severe. She seemed to improve in general health to a moderate degree. Urine was not voided normally after the suprapubic operation had been performed.

September 25. Urine, for about one week, has had much less pus and mucus in it, and hypogastric pain has been much less severe.

It was then decided to attempt an extirpation of the patent urachus, leaving the suprapubic wound unmolested.

Operation, September 27.—Dr. Briddon; nitrous oxide and ether; asepsis; dorsal position. A median incision was made from the umbilicus down to the suprapubic wound of previous operation, exposing the linea alba, which was split up in the line of the incision, exposing granulation-tissue forming the wall of the patent

urachus. By blunt dissection this tissue was then dissected free from underlying thickened peritoneum, during which process the urachus was opened longitudinally through a portion of its extent. The walls of the urachus were nearly a quarter of an inch thick, and their diameter was about half an inch. At its point of junction with the bladder it was cut transversely and removed ; the general cavity of the peritoneum not being opened. A clean surface was thus left whose floor was formed by the thickened peritoneum, and its sides by the divided portion of the linea alba. This tract was closed by eight interrupted chromic catgut sutures, passing from one side to the other through the skin and linea alba, thus approximating the raw edges of the tract. Sterile dressing was placed on the sutured wound, a rubber drainage-tube and iodoform gauze being left in the suprapubic wound.

REPORT BY J. S. THACHER, PATHOLOGIST.

Extirpation of Patent Urachus. Microscopical Examination. Granulation tissue ; spots of marked infiltration by leucocytes ; several small necrotic spots ; many giant cells ; some tissue resembling tubercle tissue—probably tubercular.

Recovery from the operation was uneventful. The bladder was drained satisfactorily for ten days, the wound for urachus extirpation healing by primary union without complication. Her general health rapidly improved, and she had gradually less hypogastric pain and discomfort. For a few weeks the patient voided no urine normally, all being discharged through the suprapubic wound. Since then she has passed almost every day one or more ounces of urine per urethram, in gradually increasing quantity. Her general condition is very much improved, the suprapubic wound is steadily closing, and urinary analysis now gives but three per cent. of albumin, with much less pus and mucus.

COMMENTARY BY ELLSWORTH ELIOT, JR.—The presence of a granulating area or of a substance that resembles granulation-tissue in the region of the umbilicus is occasionally encountered in congenital malformations. At birth, the patency of the urachus on one hand, or of the omphalo-mesenteric duct on the other, forms a swelling in the vicinity, composed of mucous membrane, which, shortly after birth and as a result of irritation, is not infrequently

covered by granulation-tissue. The swelling itself varies in size, according to the presence or absence of a prolapse of the organ with which the duct is connected. In its central portion, the orifice leading into the adjacent viscus can either be seen or detected by a probe. Through this orifice the contents of the viscus issues. If the canal communicates with the bladder, urine is almost constantly discharged; if with the intestine, fecal material appears at intervals.

Either of these two conditions is very rare, inasmuch as at birth both the urachus and the omphalo-mesenteric duct have become obliterated; occasionally, however, the obliteration is not complete, and under these circumstances, in the former event, a Meckel's diverticulum persists in the ileum, while in the case of the urachus, either its upper portion opening at the umbilicus or its lower segment, opening into the summit of the bladder, remain patent. These conditions are recognized during the patient's life, only when, as a result of some inflammatory process, an abscess forms discharging its contents at the umbilicus. In the case of patency of the upper portion, the resulting sinus may close spontaneously, or persist until the cause of the difficulty, usually a urachal calculus, is removed by the surgeon. If, on the other hand, the inflammation has involved the lower segment, the discharge of the pus is followed by the formation of a fistula, which discharges urine and which admits the passage of a probe to the bladder.

The case reported by Dr. Briddon must be regarded as an example of this type. It presents several interesting features.

In the first place, the cause of the inflammatory process was furnished by what proved to be a most intractable cystitis, which, together with the impression conveyed by the general anæmic condition of the patient, suggested a tubercular process. Repeated examination of the urine failed to discover any tubercle bacilli, and careful physical examination by G. A. Tuttle failed to detect any evidence of pulmonary or other visceral tuberculosis.

Examination, conducted by Dr. Tuttle, in the pathological laboratory, of the small ulcers, which were excised from the wall of the bladder at the time of the first operation, failed to yield positive indications of tuberculosis; conclusive evidence, at last, was furnished by the examination by Dr. Thacher of the urachus itself, removed by Dr. Briddon at the time of the second operation. Inferences are always uncertain, and although the statement that the

tubercular process originated in the patent remnant of the duct itself is not entirely justifiable, nevertheless the fact remains that examination of its wall after removal showed much more abundant evidence of tuberculosis than did the portion of the bladder-wall removed earlier by suprapubic cystotomy.

In the perusal of the history of the symptoms of the case, the discharge of all the urine through the umbilicus is worthy of mention. This is explained by the fact that the orifice of the fistula, although at a considerable distance from the cavity of the bladder, served as a means of drainage, which in cases of intractable cystitis is usually afforded by the suprapubic operation.

The contraction of the bladder is so painful to the patient that an effort is made to empty it only when it contains a certain amount of urine. An incision into the bladder either by the suprapubic or the perineal route allows the immediate exit of the urine, which, therefore, does not collect in sufficient quantities to provoke the bladder-wall to contraction. Although the fistulous tract afforded a means of speedy exit for the urine, the drainage was not sufficient to mitigate the cystitis, probably because of its tubercular nature. Incision directly into the cavity of the bladder provided a more direct route for the exit of the urine, and also by bringing about a collapse of the cavity relieved satisfactorily the congestion and the other concomitant features of inflammation.

The treatment of patent urachus in all cases consists in the closing of the abnormal orifice through which the urine escapes. The means by which this can be accomplished depends upon the particular type of the congenital defect. In the early months of infancy nature does much without outside interference to close the orifice by the cicatricial contraction which takes place in the stump of the cord. This same closure is almost materially assisted by the gradual retraction of the bladder from its position in the abdominal cavity into that of the pelvis. This process of descent, as the child grows older, also neutralizes any tendency to the prolapse of the vesical mucous membrane.

During the months in which the passage of the urine by the infant is more or less involuntary the treatment adopted by the surgeon consists in observing the usual measures of cleanliness, and in the removal of any source of obstruction to the passage of urine through the normal outlet. A condition of phimosis or of congenital stricture

can easily be relieved at this time; the presence of a valvular fold of mucous membrane at the junction of the urachus and the bladder cannot be so readily overcome but may disappear as the parts increase in size.

Conjoined with these measures of treatment compression by means of a suitably arranged button of sterilized gauze may be directed against the orifice. The greatest care must be observed to prevent the possibility of infection and the subsequent cystitis. The development of such a process lessens the chance of the success of subsequent operation, and it also exposes the patient to the dangers of a pyelo-nephritis.

If, at the end of a year or eighteen months, at a time when micturition is becoming voluntary the abnormal outlet still persists, the measures intended for its closure should no longer be delayed. Of these the least severe should first be tried, to be followed by the more radical only in case the orifice refuses to close.

Among the mildest measures of treatment is the denudation of the edges of the orifice by the application of some caustic material, such as the nitrate of silver or the chloride of zinc, healing taking place through the apposition of granulating surfaces. If this does not succeed, the edges of the orifice may be freshened by a knife and stitched in such a way that broad surfaces will be brought in contact.

Such measures are futile, of course, if infection has occurred, for union between wound-surfaces can never take place in the presence of muco-purulent urine. Under these circumstances the conditions are those which are encountered in the "acquired" form of patent urachus, which, as we have seen, is always the result of the spreading of an inflammatory process along the partially obliterated urachus to the umbilicus. Such inflammation may consist in the presence of an ordinary cystitis, which, for example, develops in the extension of a posterior urethritis, or in hypertrophy of the prostate gland. In the case reported the cause of the cystitis was undoubtedly tubercular.

In the congenital cases the cystitis results from infection introduced from without through the umbilicus.

In all these cases, the principles of treatment are identical. The inflammation must first be brought to a standstill, and only then is the excision of the tract leading from the bladder to the umbilicus

to be attempted. The subsidence of the cystitis may be brought about by the irrigation of the bladder with weak aqueous solutions of different antiseptics. Carbolic acid, boracic acid, and creolene are usually efficacious. In the case reported, the cystitis failed to show any improvement whatever as a result of such irrigation, and yielded only to a suprapubic cystotomy. Advantage was taken of this opportunity to excise several small areas of ulceration and to pass through the urachus a tampon of iodoform gauze, thus subjecting its lining membrane, subsequently found to be the seat of a tubercular process, most advantageously to an antiseptic which has no superior in the control of this kind of inflammation.

Complete subsidence of the cystitis must precede the excision of the urachus for several reasons. In the first place, this operation usually necessitates the opening of the peritoneal cavity, from which the urachus is separated only by a thin layer of tissue. The chances for the successful protection of the peritoneal cavity in the presence of foul urine, are naturally not so good as when the urine is free from contamination. Secondly, after the urachus has been enucleated to its visceral junction, it is cut off and the wall of the bladder is brought together by several rows of Lembert sutures over the inverted stump. Union will take place only when the urine is normal; otherwise the stitches loosen, the urine escapes, and in infiltrating the adjacent tissues, infects the sutures, which have approximated the edges of the divided parietal peritoneum from the umbilicus, inferiorly, resulting in either a serious form of peritonitis, or at all events necessitating the removal of the sutures between the edges of the deep fascia and the muscular planes.

In the case under discussion, the removal of the urachus was accomplished without opening the general peritoneal cavity. This may have been due to the fact that the tubercular process had resulted in sufficient adhesive thickening of the tissue adjacent to the urachus to adequately protect the peritoneal cavity, or possibly the constant presence of the iodoform gauze for five weeks before the secondary operation was done may have had a similar effect; while the immediate result of the operation was very satisfactory in that primary union was obtained, the subsequent closure of the suprapubic opening required a longer time than usual, before it was accomplished; this was only to be expected owing to the nature of the cystitis, for it is a well-known fact that the tuberculous variety is more intrac-

table than any other form, and that it is not at all unusual for the suprapubic operation to be followed by a permanent fistula. Even when it closes, the patient is not exempt from a recurrence of the difficulty, and to prevent this, as in all tubercular processes which have temporarily subsided, the patient should be placed under the most favorable environment, and should be provided with such nourishment as to keep the general health in the best possible condition.

V.

CASES IN THE SERVICE OF ANDREW H. SMITH, M.D.

Grippe Culminating in Hysteria, and Simulating Meningitis.

L. K., a trained nurse, twenty-four years of age, was admitted into the hospital February 16, 1898. There was a history of an attack of grippe beginning three weeks before admission, and characterized by general malaise, pain in the head, chest, and limbs, and afternoon rise of temperature to 103–104° F. There had also been several recurrences of earache. Four days before admission vomiting began and continued for one day. After an intermission of twenty-four hours it began again and became almost incessant, often without provocation. There had been an attack of "gastritis" during each of the three preceding autumns.

On admission the patient was in a semi-conscious condition, from which she could be momentarily aroused; with pupils widely dilated, and the palate reflex abolished. The abdomen was held rather rigidly, and was moderately tender over the upper half. Palpation immediately excited vomiting, which, even without any disturbing cause, was almost constant. The vomitus consisted of mucus, bile, and whatever was taken into the stomach. No blood was observed at any time.

Certain of these symptoms at first sight were suggestive of meningitis with pressure, to which the earache lent some color. But there was and had been no severe pain in the head, and the pupils, though dilated, were symmetrical and responded to light, and there were no other focal symptoms. Moreover, the complete absence of the palate reflex pointed to hysteria, as did also the irregular temperature, which fluctuated between 100 and 104.4° F.

Acute idiopathic gastritis, though said to have been diagnosticated on former occasions, was ruled out on account of the exceeding rarity of the condition.

There was no history of any irritating substance having been taken into the stomach.

For four days the patient grew worse, and her condition became alarming. Digestion seemed to be arrested. Milk, even if retained, as it once was for twelve hours, was returned apparently unchanged. Lavage, followed by gavage, was tried with some degree of success, but finally all stomach feeding was suspended, and the patient was nourished entirely by the rectum.

The hysterical element in the case being more fully recognized large doses of bromides were given per rectum. These had little influence upon the vomiting, indeed the immediate effect of the enemata often seemed to excite the stomach to greater intolerance, even when the greatest care was observed in the operation. Chloral added to the bromides was successful in causing a brief respite.

Finally, it was determined to resort to emulsion of asafœtida both by rectum and mouth, two ounces by the former and half an ounce by the latter. This repulsive dose was retained by the stomach, which had rejected even six-minim doses of a four-per-cent. solution of cocain. From the time this treatment was begun there was evident improvement. The following day small amounts of milk and Vichy water were retained by the stomach, and improvement from this time was rapid, the vomiting soon ceasing and the stupid mental condition clearing up.

The first three days in the hospital there was a sharp rise of temperature in the afternoon, the first day to 102°, and the second and third days to 104.4° F. The fourth day it reached only 100.6° under the use of the asafœtida, and the day following to 99.8° F. The blood was examined for plasmodia with negative results.

Neurasthenia, Hysteria—Phenomenal Eructation of Gas.

L. A. D., American, aged forty-three; single; admitted March 15, 1899. Discharged March 25, improved.

Previous History.—When a child the patient "hurt her back," and has suffered from pains in it more or less ever since. Last month she became worn out in caring for a sick friend, and some time during the winter had grippe.

The patient once fell and hurt her left elbow, but the injury was not severe, and practically "never hurts her now."

Present Illness.—For six months the patient has felt miserable, and is now nervous and easily agitated. She sleeps poorly, and in fact, lies awake two or three hours in the early morning. She complains of hot and cold flushes and "acid" dyspepsia. At times she feels as though she could not get her breath. At irregular intervals and upon friction of the left forearm, she "bloats up," as she expresses it, and has to loosen her clothes.

Physical examination by the Attending Physician was negative.

Urine.—Light amber, clear, 1020, alkaline, no albumin, no sugar, considerable indican. Quantity in twenty-four hours, eighteen to thirty-eight ounces.

Temperature range, 98.4° to 99.2° F. ; pulse range, 72 to 92.

In bedside notes, belching is said to have occurred when the back was rubbed.

Treatment was directed toward quieting the general nervous condition.

This patient had been under my observation at intervals for twelve or fifteen years. The singular feature in the case has been prodigious eructations of gas, which occurred at first only when the left ulnar nerve was pressed upon at the elbow, but subsequently when almost any part of the surface was rubbed. The phenomenon has been less marked for the last two or three years, but formerly, when the excitation area was limited to the elbow, it was very remarkable. The belching would last for several minutes, during which the patient would be almost choked by the gas. Careful observation failed to show that air was taken into and expelled from the œsophagus as is sometimes the case. Apparently the gas was liberated within the stomach.

I have never witnessed eructations approaching these in volume, except in the case of a woman whom I attended, some years ago, in two successive confinements. On each occasion, shortly after the completion of the third stage, there was belching of a great quantity of gas, lasting fully twenty minutes, and causing much discomfort to the patient. Except at these times she was never annoyed by gastric flatulence.

In the case of the present patient no treatment seemed to exert any influence upon the tendency to the formation of gas. I attempted to procure some of the gas for examination, but found it impracticable to introduce the stomach-tube on account of the extreme nervous disturbance attending the attempt.

Chronic Hydrocephalus.

M. B., female, aged fifteen; admitted February 1, 1898; discharged March 4, 1898. The patient was normal and healthy until six weeks of age. Then for two weeks was very cross and fretful as though in pain. This condition was relieved by a double otorrhœa, which lasted between five and six years.

At two months of age she had a noticeably high forehead. At five months had whooping-cough, and later, measles and chicken-pox. Between the ages of six and ten months her head increased in circumference one-half inch each month, and attained its present size when she was seven years old.

Until three years of age she was apparently of normal intellect, and knew many nursery rhymes. She was then very ill for six weeks, and since that time has been in bed. Until seven years of age she retained some memory of the rhymes she had learned, but since then has only remembered the names of the family. For some years past she has only been able to say "Mamma," and that almost unintelligibly. Of late, that is for three months, she has cried almost incessantly.

Physical Examination.—Excepting for appearance of face and presence of pubic hair, the child looks like one of six years, instead of fifteen, which is actually her age. Her general condition is one of extreme emaciation.

The upper incisors and canine teeth are large and prominent and extend down over the lower lip. The lower incisors are directed backward at an angle of forty-five degrees. There is no enlargement of superficial glands. The muscles of the neck, especially the sterno-cleido-mastoid, are developed out of proportion to other muscles. The face has a drawn, pained expression. The eyes seem normal, except for occasional slight lateral nystagmus. The pupils react well to light.

Head.—The head is extremely large. The occipito-frontal circumference is twenty-eight and a quarter inches (71.755 ctm.). The skull is entirely osseous. Each of the flat bones is bulged and separated from its neighbors by a more or less well-marked depressed suture line.

Thorax.—There is marked left scoliosis and slight kyphosis. The chest in front is very markedly flattened. The costo-chondral

FIG. 1.—CHRONIC HYDROCEPHALUS.—FEMALE, AGED FIFTEEN YEARS.

FIG. 2.—CHRONIC HYDROCEPHALUS.—THE SAME PATIENT IS SHOWN IN FIGS. 1 AND 3.

FIG. 3.—CHRONIC HYDROCEPHALUS.—THE SAME PATIENT IS SHOWN IN FIGS. 1 AND 2.

junction, just above the costal arch on the right side, is very prominent, standing out about an inch from the abdominal wall below, in appearance resembling an elbow in extreme flexion. There is a similar, though less marked, deformity on the left side.

Heart.—The heart's apex by auscultation was located in the fifth left interspace, one inch outside of the nipple-line. It could be neither seen nor felt. Its action was rapid and irregular in frequency. No murmurs could be heard. The pulse was scarcely perceptible at the wrist.

Lungs.—A few crepitant and subcrepitant râles were heard over the base of the left lung anteriorly and in the left axilla.

Liver and Spleen.—Neither liver nor spleen could be made out.

Abdomen.—The abdomen was much retracted. The muscles were held extremely rigid, making deep palpation impossible.

Extremities.—The upper extremities are rigidly held in flexion and moderate contractures exist in the arms, forearms, and fingers of the right hand. There is fairly good control of the fingers of the left hand.

All of the joints of the lower extremities are held in marked flexion, the toes in plantar flexion. The right thigh is also adducted, crossing the left in its lower third. There is no motion at the hips excepting slight passive adduction and abduction. There is a state of tonic contraction amounting to contractures of all the muscles.

Temperature.—The patient's temperature while in the hospital never went above 100.0° F., and once went down to 97.0° F.

Constipated.—The bowels were constipated at all times.

Urine.—The urine was voided involuntarily.

Feeding.—The patient had a fair appetite, but always had to be fed.

Treatment was directed simply against restlessness, noisiness, and constipation.

VI.

REMARKS ON THE SURGERY OF THE BILIARY PASSAGES WITH A REPORT OF TEN CHOLEDOCHOTOMIES

By Andrew J. McCosh, M.D.

The results of operation on the gall-bladder and gall-passages have in the last few years given such satisfactory results that there seems at the present day but little excuse for the "waiting and watching" process which was formerly, and unfortunately is still, in vogue in the treatment of these cases. It has seemed to me that in this city less attention has been given to this subject than in other great medical centres, not only in the United States but more especially in Europe. This impression has been derived from observation of numerous cases which have been allowed to suffer needlessly for weeks, months, and even years, and who finally, generally of their own accord, have insisted on operative interference, but often, unfortunately, only when their vital forces have become exhausted, their kidneys overwhelmed by the burden which has been laid upon them, in a word, in a condition where the chances of recovery from operation are perhaps but five in ten, instead of nine in ten as should have been the case had their physicians sent them to a surgeon when it became evident that a cure by medical and hygienic treatment was not to be expected. Cases I., II., and III. are examples. The patients or their family insisting, in spite of adverse opinions, on finding a surgeon who was willing to operate.

Another fact which has also strengthened this impression is the comparative frequency of operative interference for relief of diseases of the bile-passages which are performed in our large hospitals where, naturally, the great bulk of such operative cases are sent. Take, for example, the number of such operations in five of our chief hospitals where 6,300 operations of all kinds have been performed in the year 1898. During the same year but 49 operations have been per-

formed on the biliary passages. Contrast this with the 360 operations on the bile-passages performed by Kehr alone in the space of ten years, or the 100 cases of Riedel in the space of about two years, or in our own country the 75 operations done by Mayo, living in a small town in Minnesota. Compare also this relatively small number of operations on the bile-passages with those for appendicitis which have been performed in these same hospitals, 553 in number. Referring again to the operations in our five hospitals, we find that 15 out of 49 patients operated upon died soon after the operation, a mortality of over thirty-two per cent. Such a death-rate is vastly higher than that of many other hospitals. Thus Kehr had a mortality of only 3.8 per cent. for all operations on the biliary passages (exclusive of cancer and grave liver disease), and out of 180 gall-bladder operations he lost only three patients. Riedel, in 100 cases of operations on the gall-bladder, lost none of his cholecystotomies, the only two deaths in the series occurring in cases where he was forced to extirpate the gall-bladder. Mayo reports 64 cholecystotomies for stone, with one death and 11 choledochotomies without a death.

This large death-rate cannot be explained by the difference in the skill of the operator or in the care given by the assistants and nurses, but can only be accounted for by the great gravity of the cases which are transferred to the surgeon for operation. The patients either enter the medical division of the hospital or they are not sent to the hospital at all, except as a last resort after all medical treatment has failed, and of course under such circumstances the death-rate from operation must necessarily be large. A dozen or more years ago this was exactly the state of mind entertained by the profession toward appendicitis; but what a change has now come in the management of this disease! In five years to come I venture to say that in those very hospitals the number of operations on the bile-passages will have doubled, perhaps quadrupled, and the mortality be accordingly diminished by more than half, not because the skill of the surgeon will be greater, but for the reason that the profession at large, as well as patients who are afflicted either intermittently or persistently with symptoms of cholelithiasis are becoming gradually educated to the idea that their disease can be cured only by a surgical operation.

While far from advocating immediate operation in all cases of cholelithiasis yet I am inclined to believe that if we placed this dis-

ease in the same category as appendicitis many lives and much suffering would be saved. The operative mortality of cholecystotomy should not be greater than three per cent., and that of choledochotomy, or removal of stones from the common duct, should be less than ten per cent. Compare with this the mortality of cases treated medically and hygienically. Naunyn, than whom there is on this subject no greater authority, had a death-rate of 6.6 per cent. in one hundred and fifty patients treated medically, and this exclusive of all cases of cancer, and he adds that it must be borne in mind that of the 93.5 per cent. who did not die, in many the recovery was temporary only, as the stone still remained to be a source for further trouble. We must also remember that each attack of cholecystitis damages the lining of the gall-bladder, and these patients are thus left with a double predisposition to future attacks—an altered mucous membrane and a stone as an irritant. The majority of such patients will probably escape further attacks through medical and dietetic treatment, with, perhaps, a visit to Carlsbad. There remains, however, a large number, especially among the working-classes, who are deprived of the advantages of a trip to a European spa or of proper hygienic surroundings, and who will continue to suffer intermittently from biliary disturbances, and a considerable proportion who will eventually be subjected to a serious attack. In the former class when attack follows attack and the patient's health or at least happiness becomes undermined by their frequency, operative interference should not be too long delayed. It is in the latter class of cases, however, when serious and dangerous symptoms arise, that operative interference is so urgently demanded, and where delay is so unjustifiable and, alas, so common. My views on this subject may, perhaps to some, appear too radical, but it has been my lot to receive these patients on many occasions in a very deplorable condition, when there had been every opportunity weeks previously to give the patient a fair chance for recovery through operative interference. It is but lately that I saw such a case with a physician of wide experience; on my urging immediate operation he replied: "The result of the operation on the last patient I sent you was not so favorable as to encourage me to advise operative interference in this case."

The history of the case is as follows. The reader can judge whether it was not the inexcusable delay rather than the operation which caused the fatal result.

Case II.—Mrs. B. B. had enjoyed fair health, with the exception of so-called stomach attacks, until the beginning of 1893, two years before her present illness began. Since then, however, she had never been entirely well, being troubled every three months or so with an attack which gave the following symptoms: She would be seized with sudden cramp-like pain in the region of the liver and in the pit of the stomach; vomiting would follow, which was at times severe and continuous for a day or two. The pain continued generally from twelve to fifteen hours. There had never been any jaundice. The attack would generally continue for from two to four days. Her last attack occurred on April 23, 1895, and from the onset seemed more severe than usual. On April 25 she had a severe chill, followed by fever; on the 26th her symptoms were worse, and on the 27th I was called in consultation with her physician. Her temperature was 103.5° F.; she was very drowsy, and distinctly jaundiced. There was some resistance and tenderness over the gall-bladder. I urged immediate operation, but it was decided to "watch" the patient for a day or two. This process of watching continued for five days longer, during which time the serious symptoms continued, the temperature being from 102° to 104° F., and the mind being more or less obscured by the cholemic poisoning. The patient also vomited. On May 1 she was sent to me for operation. On admission she appeared semi-comatose. Her temperature was 105° F., pulse 112. Her urine contained albumin and granular casts. Though the chances of recovery seemed few, it was decided to operate, and on the same day chloroform was administered and a four-inch transverse incision was made below the costal margin. The omentum was found adherent to the abdominal wall and to the edge of the liver. On separating the adhesions a shrunken, thickened gall-bladder was exposed. A stone was felt in the common duct near the duodenum. It was extracted through an incision in the wall of the duct, which was afterward closed by a catgut continuous suture. A gauze-drain was led out through the abdominal wound. On May 2 the patient was stupid and drowsy, though her temperature remained below 100° F. On May 3 she passed but little urine, which was loaded with albumin, and contained granular casts. Her temperature began to rise, and she died on May 5, from poisoning which was mainly uremic in origin.

In the same connection I will narrate the history of two other

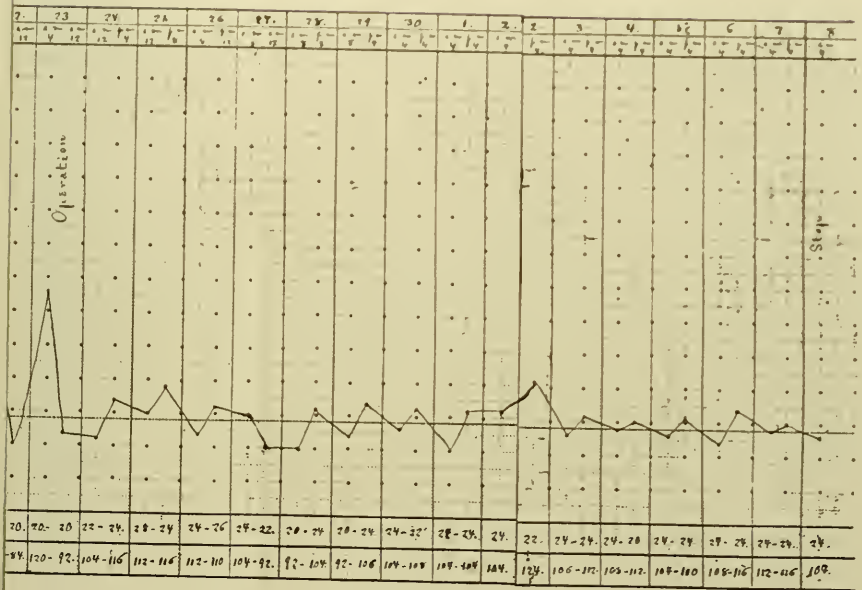
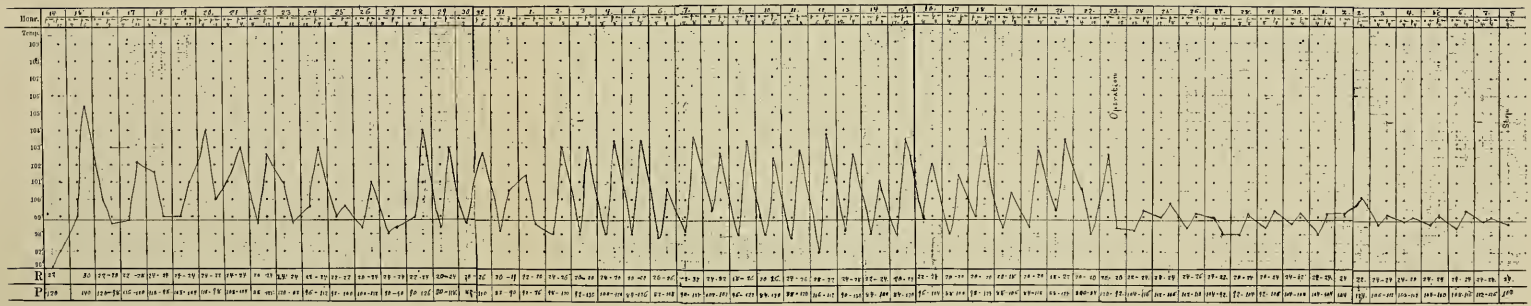

Operation
Stop

Chart for Case of Surgery of the Biliary Passage. By Andrew J. McCosh, M.D.



cases where the patients suffered for years, and were encouraged by medical advice to delay operation until they were reduced to a condition that seemed almost hopeless. The temperature chart (Case X.) which follows is a very striking one, but is not of an unusual type in cases where a stone is impacted in the common duct.

Case X.—Choledochotomy. Recovery.

Mrs. B., aged fifty-eight; mother of five children. Had always been a strong, vigorous girl, and, with the exception of occasional attacks of abdominal colic, a healthy woman, until the age of forty. Since that time, that is for eighteen or twenty years, she had suffered from attacks of colicky pain which began in the right hypogastric region, as she describes, under the liver and ran around toward the epigastric region, gripping her, as in a vice just below the ensiform cartilage. At first these attacks occurred at almost every menstrual period; later, that is for the past fifteen years, they have averaged about two a year. In the attacks the pain was so severe that a physician was always summoned and a hypodermic injection of morphine was administered. As a rule there was some vomiting, but never jaundice. The patient never had typhoid fever. In July, 1898, she was seized with an attack which lasted for three or four months, during which time she was practically confined to bed and suffered severely from pain, fever, and jaundice. The last seizure began in May, 1899, with a sudden attack of pain of a character and in the region described above. Jaundice soon followed with constant nausea and frequent vomiting. There was also fever with occasional chills. These symptoms continued through May and June. During June, July, and August a careful record of the case was kept. There was a daily rise of temperature, generally to 103° and sometimes to over 105° F. The nausea persisted and there was daily vomiting, which was so continuous that often for days all nourishment had to be given by the rectum. Chills were of frequent occurrence, there was gradual loss of flesh and strength, and the patient during the whole of the summer was confined to her bed. She was never free from pain, and the paroxysms were so severe that morphine was daily administered.

The temperature-chart for seven weeks, during which time she was in this city under careful observation, is appended, the chills being marked in red. During these weeks her suffering was great and the digestive disturbances, nausea, vomiting, and fre-

quent diarrhœa so extreme that but little nourishment could be retained.

During twenty years of her ailment numerous physicians and surgeons had been consulted. The diagnosis of gall-stone colic had generally been made, but with one exception no one had advised operation ; in fact, the opinion had been almost universal that any operative procedure was contra-indicated. Even during the summer, when the pain was so severe, the vomiting so persistent, loss of flesh and strength so marked, the opinion of several eminent physicians, and one well-known surgeon was, that the case was not fit for operation.

She first came under my care on September 19, and I at once urged immediate operation. From the history of the case I concluded that her symptoms were due to a gall-stone in the common duct, and notwithstanding the chills and fever, I felt that empyema of the gall-bladder did not exist, in spite of the opinion expressed by many that she must have a suppurative process either in the liver or in the gall-bladder.

On September 23, chloroform was administered. A four-inch vertical incision was made through the right rectus muscle with an upward curve to the left. Numerous adhesions were found between the intestines, omentum, and under surface of the liver; these were separated and the finger, carried down to the common duct close to the head of the pancreas, felt a stone more or less tightly impacted in the duct just before it entered into the duodenum. Another stone was felt not impacted, situated at the junction of the hepatic with the common duct. A finger passed into the cavity of the lesser omentum dragged up the head of the pancreas with the duodenum and common duct. Through an incision made in the latter, the walls of which were considerably thickened, a roughish round stone the size of a hickory-nut was extracted. Through the same opening was expressed the other stone, similar in size and character. The gall-bladder was with difficulty identified by tracing outward the cystic duct; it was atrophied and not larger than an almond. Indeed, it was difficult to determine where the cystic duct ended and the gall-bladder began.

The opening in the duct was closed by a continuous catgut suture. A small strip of gauze was inserted down to the line of suture, and the rest of the abdominal wound was closed by suture.

The patient made a slow but uneventful recovery. As will be seen on the chart, fever entirely disappeared after the operation, as did also her pain. The stomach remained somewhat irritable, but steadily improved. No leakage of bile occurred, and the wound was healed on the nineteenth day. The patient was out of bed on October 18, and was discharged from the hospital, cured, on November 10, and is now in good health.

Case XII.—Mrs. N., aged fifty-nine, for thirty years had been subject to severe attacks of colicky pain in the abdomen. For the past two or three years these had been so frequent that the patient had been a semi-invalid. She had scarcely dared to go out, as any excitement or undue exertion was apt to precipitate an attack. They averaged about ten a month and would last from two to twenty-four hours. During the past year they became much more frequent and more severe, were generally accompanied by vomiting, and on several occasions the patient was jaundiced. Recently their duration had been from one to three weeks. During the past year the patient had been advised by her physician, Dr. Bradshaw, to undergo operation, but she was encouraged to decline any operative procedure by the advice of a distinguished consultant who saw the patient on several occasions. On July 1, 1898, the patient had one of her severe attacks, which was accompanied by fever, and later by septic symptoms. The fever continued until the time of the operation, in August. She vomited frequently and became very much emaciated; her temperature varied from 103° to 103.5° F. I first saw the patient on August 8. Her temperature was then 104° F.; pulse 120. She was thoroughly septic, looked very weak, and seemed scarcely able to endure a serious operation. The abdomen was somewhat distended and boggy; there was some tenderness and resistance over the region of the gall-bladder, and also an indistinct mass could be felt. At the earnest solicitation of Dr. Bradshaw and myself, the patient consented to operation.

Chloroform was administered August 10. A four-inch vertical incision was made through the right rectus muscle; the omentum, edge of the liver, and colon were found adherent. The gall-bladder was much thickened around two stones each the size of a hickory-nut. Another stone of about the same size was felt in the common duct close to the head of the pancreas; this was raised up by a finger passed into the lesser omentum and the stone was ex-

tracted through a vertical incision into the wall of the duct. The opening in this was sutured with catgut. The opening into the gall-bladder was not sutured, but was surrounded with strips of gauze, which emerged through the abdominal opening. Considering the patient's condition there was but moderate shock. She made a slow recovery. There was a moderate discharge of bile for fifteen days, when it ceased. Up to the present time the patient has remained in good health.

While the main object of this paper is to report cases where a stone or stones have been extracted from the common duct (choledochotomy), it may not be amiss to say a few words concerning the diagnosis and indications for operation in cases of cholelithiasis.

"It is now believed by many that so-called biliary colic is not produced so much by the passage through or impaction of a calculus in the bile passages as it is by inflammation of the gall-bladder and ducts. As long as the bile and the biliary passages remain normal a gall-stone will as a rule produce but few symptoms. It was formerly believed that gall-stones produced colic only when they began to move along toward the duodenum, thus causing an irritation of the ducts, and that reflexly vomiting and often fever would accompany the attack, but that jaundice and distention of the gall-bladder supervened only when the stone became impacted. We now know that this view is not entirely correct. It is true that a calculus is generally the cause of the inflammation in the bile passages—probably in about ninety per cent. of the cases—but it is the inflammatory process and its complications rather than the stone which produce the severe symptoms. Distention of the gall-bladder will often take place when the cystic and common ducts are entirely free from stones, and not only will the usual symptoms which are generally attributed to the passage of a stone, such as colicky pain and vomiting, be thus produced, but also those of graver character, such as chills, fever, and jaundice, and even death, may result without the impaction of a stone. It is sometimes forgotten that jaundice may thus be produced, and I find it to be a not uncommon error to suppose that the cause of jaundice occurring in an attack of cholelithiasis must be the downward passage of a calculus and its impaction in the common duct." In this connection let me narrate the following case :

Case XI.—Mrs. A. (the daughter of Mrs. N., Case XII.), aged

twenty-nine, had been a vigorous girl, but since the age of fifteen had been subject to attacks of colicky pain in the abdomen several times a year. These attacks lasted from twelve to thirty-six hours, and were not often severe enough to confine the patient to bed. She had an attack of typhoid fever in the spring of 1898. On February 19, 1899, the patient was seized with sharp pain over the region of the gall-bladder, and until February 26 she suffered from several severe attacks of pain, occurring daily, generally accompanied by vomiting. On account of the severity of the pain she had to be kept almost constantly under the influence of morphine. On February 25 slight jaundice appeared and her temperature rose to 101° F. Her physician, Dr. Bradshaw, wisely decided that operation was necessary. She was admitted to the Presbyterian Hospital on February 26, 1899. Her temperature was 103° F., pulse 114, and she looked sick, the abdomen was moderately distended and there was tenderness over the region of the gall-bladder. She was distinctly jaundiced. *Operation* was performed the same day under chloroform anæsthesia. A four-inch vertical incision was made through the right rectus muscle. The transverse colon was found adherent to the liver. On separating the adhesions a small, much-thickened and adherent gall-bladder was found, about the size of a small walnut; there were also numerous adhesions about the cystic duct, in which were felt two small calculi. The gall-bladder was opened, and through it the stones were extracted; they were three in number, with very sharp angles, and each one not much larger than a millet-seed. The opening into the gall-bladder was sutured to the parietal peritoneum. The discharge of bile was very profuse during the next two or three weeks and caused a severe irritation of the skin, which produced more or less vomiting, which was probably nervous in its origin, but which for a few days in the second week was quite serious. The bile ceased to flow on March 24—the twentieth day. Up to the present time the patient has remained in perfect health.

Another stumbling-block which is often found in the path toward a correct diagnosis is the idea that if a stone be impacted in the common duct the result will be a distended gall-bladder. The physician will sometimes argue that a stone cannot be lodged in the common duct because the gall-bladder is not distended, and he therefore decides against operative interference because the gall-

bladder is not palpable. With a recent impaction such distention is not uncommon, but with impaction which has persisted for any length of time, a shrivelled, thickened gall-bladder is the rule rather than the exception.

This is well illustrated by the ten cases of choledochotomy reported in this paper. In six of the patients the gall-bladder was found shrunken, in two of moderate size, and in three distended.

It should also not be forgotten that cholecystitis is generally infectious and that a frequent cause of biliary calculi is the presence of bacilli in the gall-bladder.

Normal bile is sterile, but it is easily infected, and the proof is rapidly accumulating that in the majority of cases of cholecystitis the colon bacillus and often other pyogenic germs will be found in the gall-bladder, and that even before the secretion becomes purulent the general infection may be so severe as to seriously endanger the life of the patient. Case XI. illustrates this point.

"That the gall-bladder and passages are easily infected is shown by their behavior in typhoid fever. In the chapter on this subject in Keen's valuable book, it is very clearly shown that the gall-bladder contains the typhoid bacillus in nearly every case of typhoid fever. Chiari reports that in 22 cases of typhoid fever he has found on bacteriologic examination the typhoid bacillus in 19. Westcott has tabulated 74 cases of typhoid infection of the gall-bladder which have accompanied or followed typhoid fever. That the bacillus penetrates even the gall-stones is shown by the result of a hundred examinations made by Fournier, in 38 of which the typhoid bacillus was found." In this connection the following case will be of interest:

Case XIII.—Mrs. Y., aged twenty-six, of good family history, for several years had complained of occasional attacks of pain in the right hypochondrium, coming on with great severity at night and occasionally accompanied by vomiting. The pain soon subsided, and she was always up and about the next day. After her marriage in April, 1894, the attacks entirely disappeared. She gave birth to a child on April 3, 1895, and her convalescence was normal. After she had been up and about for two weeks she began to complain of chilly feelings, pain in the back and in the extremities, and sent for Dr. E. W. Hedges of Plainfield. These symptoms increased for six days and were accompanied by a gradually rising temperature

and pulse, and the probable diagnosis of typhoid fever was made. There was no pain over the liver, but on May 25 a tumor of small size was palpable in the hepatic region. At the end of twenty-four hours it had increased considerably in size and was more tender on pressure. On May 29 I saw the patient, in consultation with Drs. A. H. Smith and Hedges. There was then a tumor in the right hypogastric region which seemed about the size of a large cocoa-nut. There was some abdominal distention and some vomiting. There was also marked tenderness in the right side of the abdomen.

The symptoms pointed either to an abscess, the result of a perforated typhoid ulcer—the diagnosis of typhoid fever having already been made by Dr. Hedges—or to a cholecystitis. The temperature was 103.5° F., pulse 128. The patient appeared very ill. Immediate operation was advised, and accordingly was done in the evening, under chloroform anæsthesia. A four-inch vertical incision was made to the right of the right rectus muscle. A much-distended gall-bladder, exceedingly tense and slightly adherent to adjacent structures, was found. The patient was turned on the right side and the gall-bladder being surrounded by gauze compresses, a trocar and canula was plunged into it. Pale green bile spurted out through the canula with such force that it struck the wall, six feet distant. The bladder was then opened by an incision, and a finger passed in felt as if it were entering a bag of fine gravel. Gall-stones which would have nearly filled a pint measure were scooped out, the largest being about the size of a large pea, and the smallest resembling caviar. It was roughly estimated that about 3,000 stones had been removed. The gall-bladder was sutured to the parietal peritoneum, and a tube inserted. The wound did well, but the temperature and pulse rose steadily until, on June 7, it reached 107° F. The spleen was easily palpable, and rose-colored spots appeared on the abdomen. At the end of the third week the fever began to decrease and reached normal at the end of the fourth week. On June 8 a stitch was removed, and a leakage of bile, which had still persisted, ceased on June 12. The patient made a good recovery from her typhoid fever and has remained perfectly well ever since.

Hunner has recently reported a case of suppurative cholecystitis where at the operation the typhoid bacillus was found in the gall-bladder, though the attack of typhoid fever had occurred eighteen years before.

It is sometimes forgotten, I think, how often symptoms pointing to infection of the bile-passages occur in typhoid fever. At least my own experience leads me to this conclusion. As an example, I have been called twice this autumn by excellent physicians to decide on the propriety of operation on supposed infection in the neighborhood of the liver. While in each of these patients there were distinct signs of inflammation, in one of the gall-bladder, in the other of the covering of the liver, the fever, hebetude, and other symptoms pointed to typhoid fever, and the blood being examined gave the Widal reaction and the cases ran a typical course of typhoid fever and both recovered.

One of the main reasons for delaying operative interference in the past has been due to the doubt as to the answer to the following questions: "Is the jaundice due to a stone or to a catarrhal choledochitis? Will not the stone be forced out of the bile-passages into the intestine by nature? Will it not drop back into the gall-bladder, where it may remain innocuous for years?" In regard to the first of these reasons for doubt it may be granted that in some patients the severe characteristic pain which is caused by the passage and impaction of a biliary calculus may be absent. An anticipatory hypodermic of morphine may have cut short the pain before special attention was attracted to its severity, or the personal characteristics of the patient may have been such that the pain was not regarded as of so much importance as the severe vomiting followed by jaundice which may have been the most prominent symptoms. The following quotation is from the recent excellent address of Mayo Robson in "The Dangers of Delay": "I think the blame rather lies in the traditions of the past that we have not yet completely shaken off, in the reminiscences of the old days when an operation was a truly dreadful business, to be avoided if possible, and possibly it lies a little in that *laissez faire* policy of the old school, for there are as yet a good number of Micawbers in the world and we know that they are sometimes encouraged by the unexpected turning up."

It may be only after the expiration of two or three weeks, when the symptoms do not abate, that the probability of a catarrhal jaundice can be cast aside. When at the expiration of this time the local tenderness, the pain, the vomiting, and the jaundice still persist, and especially if the fever assumes a septic course, the probability of a stone being the cause of the attack becomes very great. The pres-

ence or absence of a palpable tumor would be of the greatest importance, but unfortunately, this is frequently absent, and the longer the attack has persisted the more likely is such a tumor to be wanting, for, as has already been stated, if the impaction in the common duct has existed for a length of time, a shrunken gall-bladder is found more often than is one distended with bile. The absence of such distention is an argument which, in my experience, is often used against the need of operative interference.

An argument which has been advanced more than once against the operative treatment of gall-stones is that the stones may recur. This seems hardly worthy of consideration. Undoubtedly new stones may form, but the same objection may be brought against extraction of vesical calculi, and indeed against many of the operations in surgery. In answer to this same objection it has been claimed by some surgeons, myself among the number, that even should new stones form their extraction by a secondary operation following a previous cholecystotomy would be a comparatively simple procedure. Under such circumstances the gall-bladder should be found attached to the parietal peritoneum directly under the scar, and theoretically all that would be needed would be to make an incision through the scar-tissue and at once enter the gall-bladder. A recent experience has convinced me that this idea is very erroneous. The patient was a woman from whose gall-bladder, in February, 1896, I had removed three stones, afterward making a cholecystotomy by suturing the outer edge of the gall-bladder to the parietal peritoneum. This was followed by discharge of bile for thirty-one days and for three and a half years complete freedom from pain or illness of any kind. In October, 1899, she began to have symptoms of a cholecystitis culminating in a sharp attack in the middle of November. An incision was made through the old cicatrix, and the shrivelled, retracted gall-bladder found with great difficulty. It was no larger than an almond, and was drawn upward and backward under the liver, where it was lodged, covered by a coat of adherent intestine, at a point two inches distant from the abdominal wall, to which it was apparently connected merely by a strong band of adhesions. In it were a few small calculi.

Ten operations for removal of stone from the common duct (choledochotomy) are reported in this paper. Of these two died, a mortality of twenty per cent. It is doubtful, however, if the operation hastened death in either of these patients, the fatal result being due

to the wretched state to which they had been reduced, a condition which in both was due to delay. Considering the critical condition of seven of the ten patients on whom the operation was done, it is rather surprising that the mortality has not been greater.

The incision which I prefer for manipulations on the common duct is one which splits the right rectus muscle. The curve upward toward the median line has been sometimes added as it gives additional room. The incision of Bevan which adds a curve outward at the lower end is in some cases of considerable value. The duct is not easy to find, but usually the stone can be felt without much difficulty.

It is generally located near the entrance of the duct into the duodenum. The finger passed into the cavity of the lesser omentum can then raise these structures together with the head of the pancreas within reach, and while thus steadied a vertical incision is made into the generally thickened and enlarged common duct and the stone extracted. This is sometimes, especially in short, stout patients, attended with much difficulty.

The question then arises, shall the opening in the duct be sutured? The advantages of suture are that the abdominal wound can be almost completely closed and that, should no leakage occur, convalescence is much shortened.

The objections advanced against such closure are the difficulties attending suture of the opening of the duct, the additional time consumed, and the loss of free drainage of the gall-passages.

In regard to the difficulties and the prolongation of the operation I do not think that in the ordinary case we should be influenced by such objections. A few minutes will suffice for suture, and as a rule the difficulty is not unsurmountable. In regard to external drainage, there may be some advantages in leaving the duct open in order that the diseased mucous membrane may be brought into a healthy condition. If, however, the duct as far as the intestine be free, is not drainage by this route equally efficacious and more natural? The leakage for weeks of bile through the wound cannot be lightly dismissed. It is not only annoying to the patient but at times is of serious import on account of its irritating qualities to the skin, and more especially on account of the malnutrition which occasionally results on account of the effect on digestion of the absence of this fluid.

It is also true that we cannot always be positive that the duct and its mouth are freely pervious. If we fear that it be occluded it is wiser not to close the opening, but even if it be closed by suture, provided the material employed be catgut, a slightly increased pressure will tear it open. For this reason I never close the abdominal wound without drainage. A strip of gauze is invariably inserted to drain any leakage which may follow. In all of the ten cases reported the opening in the duct has been sutured, not always, however, satisfactorily. In three cases out of nine no leakage has occurred (Case VII. died on the second day, and while there was no leakage this case is excluded). In two of the other cases the leakage was very slight.

A report of the remaining seven cases of choledochotomy follows.*

Case I.—Mrs. J. M., aged forty-two. With the exception of malarial attacks, the patient had always enjoyed fair health until the end of August, 1894, when she, without known cause, was seized with sharp epigastric pain, chill, and vomiting. Soon after jaundice appeared, and she was feverish. She noticed the gradual development of a lump on the right side, just below her ribs, which became quite large and felt as hard as wood. Her abdomen, especially in the region of the lump, was extremely tender. She had considerable fever; and during the illness, which kept her in bed for five or six weeks, she was at times delirious. The pain in the right side was almost constant, and was also felt at the same level in the back. She was constipated. The stools were clay-colored. At the end of a few weeks the jaundice began to fade and the vomiting ceased. Her pain also became less severe, and she was able to move about for some weeks, when another attack, similar to the first, but less severe, occurred. During the autumn and winter she had a series of attacks, beginning with a slight chill and always attended by jaundice and by an increase of the pain, and usually by fever and vomiting. During these attacks the stools were clay-colored, and between the exacerbations the color was light brown. From September to March she was never entirely free from pain; her skin was never perfectly clear; and during more than half this period she was distinctly jaundiced.

On March 6, 1895, she came under the care of Dr. Forbes

* Some of these histories have already been published in the Journal of the American Medical Association.

Hawkes. He observed her for a week, and during this time her temperature ranged between 99° and 100° F.; pulse, 90 to 110. From her history and symptoms, Dr. Hawkes made the diagnosis of stone impacted in the common duct, with inflammation of the ducts and a plastic peritonitis around the gall-bladder and ducts.

Condition on Admission. — Temperature, 99.5° F.; pulse, 96. Slight jaundice. Stools clay-colored. She complained of pain below the border of the liver. Liver dulness reaches two or three inches below free border of the ribs, where its edge was felt. Under the right rectus muscle, just below the ribs, a small nodular mass could be felt, which was somewhat tender on palpation. On account of the sudden onset of the symptoms, the intermittent character of the obstructive jaundice, the absence of tumor and of ascites, I concurred in the diagnosis of Dr. Hawkes, *i.e.*, calculus impacted in common duct.

Operation, March 19.—A vertical incision was made outside the right rectus muscle, and when the peritoneum was opened the omentum was found adherent to the gall-bladder, bile-ducts, and duodenum. The gall-bladder was of moderate size, and in it were felt a few small calculi. The cystic duct was traced down to the common duct, which latter was imbedded in a mass of inflammatory tissue which bound the intestines and duct firmly together, and at a considerable depth in this mass could be felt a hard substance. The incision was enlarged by a transverse one through the right rectus muscle. The adherent intestines were separated, and the hard substance was found to be a calculus impacted in the common duct near its point of entrance into the intestine. Passing my left index-finger under the stone, it, with the duct, was drawn forward and downward. While so held a vertical incision was made in the wall of the duct, and a stone, the size of a hickory-nut, extracted. Two smaller stones and an ounce or two of bile escaped, the latter being absorbed by the gauze-pads which were used to protect the intestines. The calculus had been impacted in the duct about three-quarters of an inch from the duodenum. A probe was then passed through the duct, which was found pervious through its whole length. Its walls were much thickened, being fully an eighth of an inch in thickness. The incision in the duct, which was one inch in length, was closed by two rows of interrupted catgut sutures. A strip of gauze was placed over the line of suture and brought through the abdominal wound, the re-

mainder of which was then closed. A moderate amount of shock followed. Recovery was uneventful. On the seventh day the gauze was removed. No sign of leakage appeared at any time. The temperature was not over 100°, except on the fourth day, when it reached 100.5°. For the first week the pulse ranged above 100, and then, with temperature, fell to normal. There was a movement of the bowels on the fifth day, which was light brown, and afterward the stools were of normal color. On April 23 the sinus was completely closed, and on April 29 the patient was discharged, cured. She has been well ever since. The wound is firmly united without sign of hernia.

Case III.—Mrs. E. M. S., aged thirty-seven. The patient had always been healthy, having borne ten children without complications. In November, 1894, she had an attack of biliary colic. In May, 1895, a second attack of biliary colic occurred, with the sudden onset of excruciating pain, which was only quieted by a hypodermic injection of morphine. Two days later a chill occurred, accompanied by vomiting followed by fever, which symptoms continued for two weeks. The pain then gradually subsided; but since that time, on and off during the winter of 1895, she complained of pain, soreness, and swelling on the right side of abdomen. She was confined in May, 1896; during the later months of her pregnancy the pain was more severe and necessitated the use of morphine. After her confinement the pain disappeared, and she was comparatively well until the beginning of September, when the pain in the right side of the abdomen reappeared, and until the date of her admission to the hospital, October 26, she was confined to bed. Any motion was followed by marked increase in the pain. The bowels were constipated. She had not noticed jaundice.

On admission the patient was pale and considerably emaciated, the abdomen was somewhat tender, especially on the right side, and considerable resistance was felt below the free border of the ribs, extending down as low as McBurney's point. Just above this point a small, hard mass was indistinctly felt, which was very tender, and seemed to be the size of a duck's egg. The edge of the liver could not be felt.

Operation, October 27.—Chloroform, followed by ether. A vertical incision along the outer border of the right rectus muscle was made midway between McBurney's point and the edge of the liver.

The appendix, five and a half inches in length, was found somewhat thickened and containing an enterolith; it was removed, as was also the right ovary and tube, which were found diseased. The incision was enlarged upward, the liver was found adherent to the anterior abdominal wall, the gall-bladder being considerably distended, very tense, and somewhat adherent to the omentum. It was shut off by gauze-pads from the general peritoneal cavity. The patient was turned on the right side and several ounces of bile, mixed with pus, were evacuated by a trocar. The opening in the gall-bladder was enlarged, the finger passed in, and nine faceted stones, varying in size from a large pea to a hickory-nut, were extracted. Ten smaller stones were found wedged in the cystic duct and were extracted. A stone was now felt impacted in the common duct just beyond the hepatic duct; efforts were made to extract it through the cystic duct but it was so firmly lodged that they failed. The left index-finger was passed above and under the common duct and while thus held up, a vertical incision was made through the wall of the much-thickened duct, and a stone the size of a large hickory-nut was extracted. A probe passed freely into the duodenum. Considerable bile escaped from the opening into the duct. It was closed by two layers of interrupted catgut sutures. The opening into the gall-bladder was also sutured by two layers of catgut. A gauze drain was passed down to the sutured common duct and the rest of the abdominal wound closed. The patient made a good recovery, the maximum temperature being 101° on the second day. The gauze was removed on the fifth day; there was no leakage of bile. The wound was closed on the seventeenth day and the patient was discharged, cured, on the twenty-fifth day, and has remained in excellent health ever since the operation.

Case IV.—Mrs. L. S., aged forty-one. The patient had always enjoyed good health until March, 1896, when she had an attack of severe pain over the liver region; this lasted two weeks. In the middle of November, she became pregnant (her third pregnancy); on December 15 she was seized with sudden shooting pain below the ribs on the right side, which was very agonizing, and was accompanied by nausea and vomiting; this was followed by deep jaundice. During the next three months she had six similar attacks, in each one morphine being needed to quiet the severe pain. The attacks lasted from two to three days, but in the

interval she was never free from pain and was practically confined to bed. The jaundice never entirely disappeared, though it was variable. On examination the abdomen was somewhat distended, and there was considerable tenderness over the region of the gall-bladder, where a mass was indistinctly felt. On account of her pregnancy and her extreme unwillingness to submit to operation it was delayed by her physician, Dr. S. R. Morris, and myself, rather longer than under ordinary circumstances would have been wise.

She was admitted to the hospital on March 17, 1897, and on March 18 the operation was done under chloroform. A six-inch oblique incision was made below the last ribs; the liver edge was found two inches below the costal margin; beneath it was a distended gall-bladder, very pale in color and slightly adherent. The finger touched a stone in the common duct just before it entered the duodenum, the intestines being held back by gauze compresses. The common duct was hooked up by the finger passed into the cavity of the lesser omentum while the duodenum was held to one side. An incision was made into the duct and a stone the size of a hickory-nut extracted; this was followed by a free discharge of bile. The opening was with considerable difficulty sutured with catgut. A gauze-drain was led out through the abdominal wound. The patient made a good recovery; there was considerable leakage of bile until April 6, when it ceased, and the patient was discharged, cured, April 14. She went on to term and was delivered of a healthy child.

Case V.—R. H., aged fifty, married, had enjoyed fair health, though she had occasionally suffered from attacks of so-called indigestion. In February, 1897, she suffered for ten days from a short attack of what was called biliary colic; she remained well for two weeks and then came another severe attack. Since then, until May 24, when she was admitted to the hospital, she had suffered from similar attacks once or twice each week. The attacks generally lasted about two days, and began with severe pain over the region of the gall-bladder, with vomiting. This was followed by chills and sweating. From May 10 to 12 she was slightly jaundiced. During most of this time the urine had been of a dark mahogany color.

On admission she was found to be a well-nourished woman; the abdomen, which was very fat, was somewhat tympanitic, and just below the free border of the right ribs there was slight tenderness, but no resistance and no tumor could be felt.

Operation was performed May 26, under chloroform anæsthesia. A four-inch oblique incision was made an inch below the right costal margin, and the omentum was found adherent to the under surface of the liver, which was small in size. Under its edge was felt the shrunken and much-thickened gall-bladder, adherent to the neighboring structures. After considerable search, which was difficult on account of the adipose tissue and numerous adherences, a calculus was felt at the junction of the common and cystic ducts and another in the common duct close to its entrance into the duodenum. As it was impossible to move either stone, the common duct was therefore hooked up with the left index-finger and its wall incised and a three-faceted stone, the size of a hickory-nut, extracted. The other stone, somewhat smaller in size, was pushed through the same opening. The opening in the duct was closed by continuous catgut suture. A gauze-drain was inserted and the remainder of the abdomen closed. The patient made a good recovery, there being a slight leakage of bile until June 27. She was discharged from the hospital July 2, and since that time has enjoyed good health.

Case VI.—Mrs. E. D., aged sixty. The patient, with the exception of occasional attacks of so-called indigestion, had been a healthy woman until the winter of 1896. She is the mother of six children. She never had typhoid fever. About Christmas, 1896, after a heavy dinner she was seized with severe "stomach cramps." They were of so severe a character that her physician gave her a hypodermic injection of morphine. For a few days she was confined to bed. She remained well for about six months, when she had an attack similar to the first, but confining her to bed with pain, fever, and slight jaundice for about two weeks. Since that time (August, 1897) she has been occasionally troubled with slight colicky pain and soreness in the epigastric region. She remained comparatively well till January 3, 1898, when she was seized with an attack similar to the others. Instead of disappearing, however, in a few days, the pain, fever, and vomiting continued, and on January 15 slight jaundice was noticed. She had frequent chills, and on January 17, the day of her admission, the temperature was 104.5° F., pulse 125. She was slightly jaundiced, the abdomen was somewhat distended, and there was tenderness in the epigastric region.

Operation was done under chloroform anæsthesia on January 18. An incision, with a curve toward the median line at its upper end,

was made through the right rectus muscle. The colon and omentum were found adherent to the edge of the liver. The gall-bladder could not be felt even after separation of the adhesions. A finger carried down toward the duodenum touched a stone. The common duct was then drawn upward and a stone about the size of a hickory-nut was found impacted near its entrance into the intestine. It was extracted by an incision through the wall of the thickened and distended duct. Its extraction was followed by that of two smaller stones. It was with considerable difficulty that the duct was closed by a continuous catgut suture, as the patient was short and stout. A strip of gauze was led through the abdominal wound. The patient, during the operation, was in poor condition but reacted well. A slight leakage of bile appeared on the fourth day and continued for fifteen days. Otherwise convalescence was uneventful. The wound was healed on the twenty-fourth day, and the patient left the hospital on the twenty-ninth day.

Case VII.—P. D., male, aged sixty. The patient was of marked alcoholic habit. For years he had been troubled more or less with attacks which he attributed to his stomach. About November 1, 1897, he was attacked with pain in the region of the liver, vomiting and jaundice following; the latter disappeared in a few days, but he was not free from pain, and two or three weeks later he had another attack, and again on December 13 a more severe attack accompanied by constant vomiting and jaundice. He was admitted to the medical division December 31, 1897. His abdomen was somewhat distended and was tender over the region of the gall-bladder. He was markedly jaundiced, and there was considerable vomiting. His temperature was 105° F. During the next few weeks the jaundice persisted, there was occasional vomiting, his temperature varied from 99° to 102.5°. He was transferred to the surgical wards January 17, with a temperature of 103° F.

Operation, January 18, 1898.—Chloroform followed by ether, both anæsthetics being taken very badly. A vertical incision was made through the right rectus muscle; the omentum was found adherent to the gall-bladder, which was much thickened and rather small. Two stones, each the size of a hickory-nut, were felt in the common duct, and were extracted through an incision which was afterward sutured with catgut. A drain of gauze was brought out through the abdominal wound. He reacted slowly from the anæsthetic, and on

January 19 he was very cyanotic; temperature, 104° F., respirations, 32; he became more and more cyanotic, his expectoration became bloody, and he died on that same evening from pneumonia complicated with nephritis.

Case VIII.—Mrs. E. J., aged fifty-two. For eight or ten years she has been subject to bilious attacks, consisting of pain in the upper right side of the abdomen and accompanied by vomiting; the attack lasted usually from one to three days; she had been jaundiced but once. The present illness began on May 8, 1898, when she was seized with severe paroxysmal pain below the right costal margin. There was no fever or vomiting and no jaundice. On May 15 she had another attack of severe pain and vomited persistently for twenty-four hours. There was marked local tenderness in the right hypogastric region. On May 17 slight jaundice appeared.

She was admitted to the hospital on May 18. The abdomen was slightly distended; she was tender over the right hypogastric and lumbar regions; there was marked jaundice; temperature was 102°; she was very drowsy.

Operation was performed May 19 under chloroform. A mass could be felt in the epigastric region just to the right of the vertebral column. A four-inch vertical incision was made through the right rectus muscle. The edge of the liver was hard, irregular, and much engorged, and was slightly adherent to neighboring structures. The gall-bladder was not visible. There was felt, just to the right of the bodies of the vertebræ, a hard mass the size of a duck's egg, to which were firmly adherent omentum and intestines. The mass was at first supposed to be a carcinoma, but after separating adhesions it was found to be a huge stone, occupying the entire length of the common duct, which had become enormously distended to contain such a large mass. It was with considerable difficulty that the duct could be exposed so that a three-inch incision could be made through its wall, which was very much thickened. The stone, however, was too large to emerge from such an opening. It was therefore broken into several pieces with the points of a strong pair of scissors and was extracted piecemeal. It was then found that the mass consisted of an amalgamation of a number of stones, the two largest being about the size of a walnut. These were so firmly agglutinated that considerable force was required to separate them. The mass was four inches in length and the maximum circumference

was six inches. A large amount of bile escaped after the extraction of the stone. The cystic duct was shortened and was apparently empty, but the finger passed on toward the gall-bladder. At its neck was found a constriction, and beyond this in the bladder itself were found thirty or forty smaller stones, the largest being the size of a hickory-nut. The gall-bladder was contracted around these stones and was much thickened. It was not opened. The opening in the common duct was partially sutured with catgut. To facilitate drainage a counter-opening was made in the right lumbar region, through which a strip of gauze was passed, as was also another which was led out through the abdominal opening. Considerable shock followed, but she soon rallied. Her mental state improved daily, though it was ten days before it became normal. There was a free discharge of bile until June 20—thirty-two days—when it ceased. The maximum temperature was 101° on the second day. The patient was discharged, cured, on June 30, and up to April, 1899, had remained in good health.

CHOLEDOCHOTOMIES.

Case.	Name.	Age.	Date.	Gall-Bladder.	Calculi.	Duct Sutured.	Leakage.	Result.
1	Mrs. J. M....	42	Mar. 19, 1895.	Thickened. Size moderate.	1 large and 2 small.	Yes.	None.	Recovery.
2	Mrs. B. B....	37	May ', 1895.	Thickened and shrunken.	1 large.	Yes.	Yes.	Died fourth day. Pneumonia and cholemia.
3	Mrs. E. M. S.	37	Oct. 27, 1896.	Distended.....	1 large.	Yes.	None.	Recovery.
4	Mrs. L. S....	41	Mar. 18, 1897.	Distended.....	1 large.	Yes.	For 18 days.	Recovery. At time of operation patient was five months pregnant. She did not abort.
5	Mrs. R. H....	50	May 26, 1897.	Thickened and shrunken.	2 large.	Yes.	Slight for 31 days.	Recovery.
6	Mrs. E. D...	60	Jan. 18, 1898.	Thickened and shrunken.	3 large.	Yes.	Slight for 15 days.	Recovery.
7	Mr. P. D.....	60	Jan. 18, 1898.	Thickened and shrunken.	2 large.	Yes.	.....	Died on second day. Pneumonia and nephritis.
8	Mrs. E. J.....	52	May 19, 1898.	Thickened. Size moderate.	1 very large.	Yes.	For 32 days.	Recovery.
9	Mrs. U.....	59	Aug. 10, 1898.	Thickened and shrunken.	3 large.	Yes.	For 15 days.	Recovery.
10	Mrs. B.....	58	Sept., 1899.	Atrophied.....	2 medium.	Yes.	None.	Recovery.

In none of these cases has the shock of the operation been extreme, and in none has there been unusual hemorrhage. Indeed, in over one hundred operations on the liver and gall-passages I have never encountered excessive bleeding. Probably in twenty per cent. of these patients jaundice more or less pronounced has been present,

but it has never seemed to me to influence the amount of bleeding. Doubtless sooner or later I will be unfortunate enough to experience serious hemorrhages, but the fact that it has not occurred in over one hundred operations must indicate that it is at least uncommon.

Case IV. was, at the time of operation, pregnant about four months. The pregnancy was not disturbed and the patient afterward went to term.

In Case VIII. an enormous stone, weighing two ounces and three drachms, was extracted from the common duct.

VII.

A CASE OF A RETAINED AND MISPLACED INTUBATION-TUBE EXTRACTED BY LARYNGOTOMY.

By Andrew J. McCosh, M.D.

Intubation of the larynx is undoubtedly one of the most valuable and life-saving procedures which has been introduced into medical practice during the last quarter of a century. The Presbyterian Hospital should be especially interested in all that pertains to this procedure, for its originator and at the same time its perfecter, the late Dr. Joseph O'Dwyer, was a frequent and welcome visitor to our wards and operating-room. Many of us will always remember and value the wise council, the keen insight, and the modest demeanor of this great and noble physician.

The following history tells of one of the accidents of intubation:

A. B., a female baby, one year old, was, in September, 1897, seized by an attack of croup. During four days its breathing was much obstructed, and it suffered from urgent dyspnœa. An intubation-tube was inserted by an inexperienced operator. It gave comfort and was worn for two or three days, though it was several times accidentally pulled out by the string. It was then extracted and an attempt was made to dispense with the tube. The obstruction to the breathing, however, compelled its re-insertion. During the week following several similar attempts were made, but the longest time that the child could breathe without the tube was ten hours. About the eighth day while an attempt was made to extract the tube from the larynx, it was lost during a severe fit of coughing. It was supposed that the child had swallowed the tube. The difficulty in breathing again became marked and attempts were made to insert another tube. They failed, however, and the family physician confessing that it was his first attempt as an intubationist called a skilled specialist in consultation. The latter, with the long intubation forceps, searched the larynx for a foreign body

Retained Intubation Tube.

or for an obstruction, and not finding any, inserted an intubation-tube without much difficulty. The breathing became gradually worse, the child became cyanosed, and on auscultation no respiratory sounds were heard over the right chest. It was at once suspected that the cause of the obstruction might be a misplaced tube, and accordingly the baby was at once brought to the hospital. Dr. Charles W. Stevens was fortunately in the hospital, and at once, with the fluoroscope, identified two intubation-tubes in the air-passages, one, as will be seen in the photograph, in the trachea, the other in the larynx. As the child was much cyanosed, with labored breathing, rapid pulse, cold sweat, feeble, intermittent pulse, it was at once brought to the operating-room. A few whiffs of chloroform were given, and rapidly an incision was made through the lower rings of the trachea and a black rubber intubation-tube, with its head at about the level of the upper border of the sternum, was seen and extracted. At the upper extremity of the incision the lower end of another tube was seen, and was also extracted. A tracheotomy-tube was inserted and the child at once revived and breathed comfortably. It was the opinion of Dr. O'Dwyer, who was present, that the cricoid ring must have been either abnormal or have been broken in previous efforts at introduction or removal of the tube.

During the following ten months the child was under observation. Many attempts were made to insert an intubation-tube and remove the tracheotomy-tube. They all failed, however, and the child could not breathe when without the tracheotomy-tube. Gradually the calibre of the larynx became shrunken and finally obliterated. At the end of nine months, for a distance of one inch and a half, no passage through the larynx could be found by any instrument. An attempt to pass a probe under chloroform was made, but failed. It was determined to perform an operation to either restore the calibre of the larynx or to remove the organ; but in July, 1898, the child was seized with pneumonia and died.

VIII.

TYPHOID FEVER IN AN INFANT NINE MONTHS OLD —RECOVERY.

By W. P. Northrup, M.D.

This case will be of especial interest to those who have followed an animated discussion started in the American Pediatric Society, five years ago, and taken up elsewhere on occasions. The writer at that time, basing his statements on the records of the New York Foundling Hospital, argued that typhoid fever in patients under two years of life was rare. This statement was challenged by numerous persons, notably Chicago members of the Pediatric Society. Later the writer found that he had started a discussion in which all older physicians, all Chicago physicians, and many contemporaries had withdrawn to a separate camp, and were prepared to give battle, not omitting to rejoice over the coming victory. Let it be remembered that Chicago physicians at that time had good opportunities of studying typhoid, and had just passed through an experience with a formidable epidemic.

The writer was led to review his former arguments and determine exactly the position he was willing to take. Facts from hospitals had been given out before, and there was little to add to facts, except deductions, and these were now made and added. To these again were added what could be safely culled from literature. General writings, from lack of exactness on this particular subject (typhoid fever), are found to furnish but little convincing proof of anything.

The thesis, as stated on a second occasion, was as follows: "Typhoid fever is a disease to which there is little susceptibility in children under two years of age. In epidemics, children under two years of age, though naturally little susceptible, may, in the presence of an overwhelming poison (multiplied exposures) acquire typhoid fever." *

* Read by title before the meeting of the American Pediatric Society, Virginia Hot Springs, May 27, 1895. Published in the Archives of Pediatrics, December, 1895.

This position was subsequently assailed with vigor by nearly all the society, excepting my two contemporaries, Rotch, of Boston, and Holt, of New York, who sustained the thesis.

The next step was the report of a well-known epidemic in Stamford, Conn. The writer followed some cases in infants who accommodated themselves to the exception, as stated in the thesis. There were four patients under two years, all infected by poisoned milk from a single source. The first infant was under two years, and was infected in the epidemic. To be exact, it was thirteen months old, had fed upon milk which had infected its father and brother, and a hundred other inhabitants of the city. The disease was undoubted typhoid; having the characteristics of continued fever, prostration, and apathy, large spleen, and rose spots. The father recovered after intestinal hemorrhage, and the brother after a severe course with prolonged delirium. The infant also recovered.

The second infant was twenty-two months old, and died from pulmonary complications. Autopsy confirmed the diagnosis.

A third case was sixteen months old, and recovered.

A fourth was twenty-two months old and recovered.

These are the only cases under two years in an extensive epidemic, with many deaths, including the physician with whom the writer visited the cases, and viewed the well from which the infection agent was supposed to have been derived. There were thus four cases under two years of age.

The thesis put forth on facts from institution records has been sustained by exact methods, by Lovet Morse, of Boston. He has applied the Widal serum test to cases of continued fever of doubtful origin, coming to dispensary in Boston. His conclusion, so far as a single Widal test is reliable, is that "Typhoid fever in infants (under two years) is rare."

At the present moment, then, there are printed reasons enough in existence to warrant the writer in stating that the thesis is sustained.

Delafield once said: "There is nothing too irregular to be typhoid fever." That is quite true. Yet there is no diagnosis so often a misfit. In adults typhoid is named something else; in infants something else is named typhoid. Continued irregular fevers in infants and young children, due to catarrhal enteritis, are often first tried with quinine, and then classed as typhoid.

The case which occasions this paper is the youngest undoubted case in the experience of the writer. It is that of typhoid fever in a female patient aged nine months. At the time of admission the father and two brothers were in the hospital with typhoid fever. The mother was not infected and nursed the baby at her breast. The infant had been crawling about the bed of its father, sick in his second week, and a brother sick seven weeks. This brother, who never came to the hospital, was the first member of the family to have typhoid fever—five being sick in all.

Previous History.—Twelve days before admission, a physician took the temperature and told the mother the baby had the "same sickness." For a week previous to that, the mother says the child's passages were frequent and greenish. They were frequent and greenish on entrance to hospital. There is a history of continued fever, diarrhœa; no convulsions.

On admission the child was plump, pale, no marked prostration; tongue coated, whitish; temperature, 103° F. After an enema the child passed yellowish fecal matter, with considerable mucus and some rolled-up masses.

Symptoms and Course.—The abdomen was markedly distended, hard, tympanitic for two days, difficult to relieve. Turpentine stupes, high rectal enemata, and finally castor oil were employed, with ultimate success.

Spleen, distinctly palpable, one inch and a half below free border of ribs.

Liver, one inch below free border.

Eruption—characteristic rose-spots, few in number, on abdomen and back. These appeared on the sixth day in hospital.

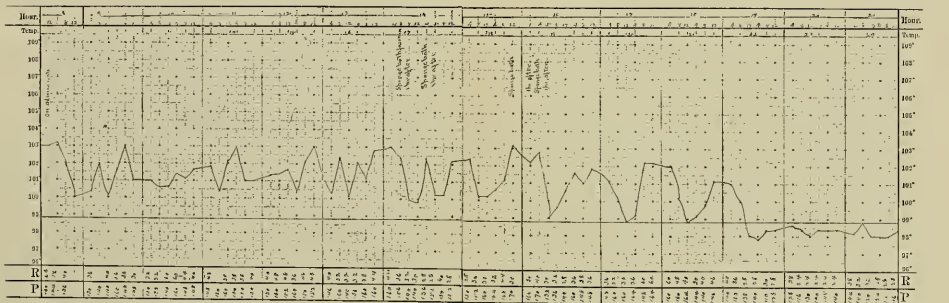
Cerebrum—The child was dull and stupid much of the time, though never impressing one as very sick.

Passages continued frequent, soft, containing mucus and greenish pultaceous masses for about ten days. These were little affected by treatment, and seemed to improve only when the disease with temperature began to wane. By the nineteenth day of the disease the temperature was returning to normal, the spleen was markedly diminished; then it was that the last mucus disappeared from the passages; slight cough, no pronounced signs of bronchitis.

The temperature reached 103° F. daily for the first nine days, thereafter, and gradually fell away to normal on the twelfth day

after admission. From the time the family physician first took the temperature to the end of the fever in hospital was twenty four days

TYPHOID FEVER IN PATIENT NINE MONTHS OLD; RECOVERY. BY W. P. NORTHRUP, M.D.



November 8.....Blood: No Widal reaction.—Dr. Thacher.
" 13.....Blood: No Widal reaction.—Dr. Thacher.
" 16.....Culture from urine: No growth, Nov. 20.—Dr. Thacher.
" 19, 5 P.M. No malarial organisms found.
November 20.....Blood: No Widal reaction.—Dr. Thacher.
" 24.....Blood: Good Widal reaction.—Dr. Thacher.
December 1.....Blood: Strong Widal reaction.—Dr. Thacher.

after admission. From the time the family physician first took the temperature to the end of the fever in hospital was twenty-four days.

Complications.—Pustules on scalp and back of trunk.

Symptoms.—The most troublesome were diarrhœa and tympanitis.

Diagnosis.—This was confirmed on the following symptoms and signs; Continued fever, markedly enlarged (feelable) spleen, diarrhœa and distention, rose spots, Widal serum test (twice). The blood examination was of interest. Repeated examinations showed no plasmodium malariæ, and no Widal reaction. Although the other cases from the same family showed a characteristic serum reaction, this infant's blood failed repeatedly to give the reaction. It was not till the twelfth day in hospital, and when the temperature had returned to normal, that the Widal test confirmed the diagnosis. This was a perfectly satisfactory, prompt reaction with a dilute culture. To make assurance more assured, another test was made four days later; reaction positive and satisfactory. It may be added that the urine, drawn by catheter, had been twice cultivated, and no growth was reported. The last culture was on the day on which the Widal test was first reported positive.

Treatment.—Feeding of a nursling in typhoid fever naturally was most important. The mother came three times a day at first, and nursed the baby. Feedings were given, of milk diluted with water and lime-water. The feedings seemed to disagree. At least the condition of the bowels as indicated by diarrhœa with passage of mucus and curds. It was therefore thought best to feed wholly on modified milk.

The following feedings were furnished by the Walker-Gordon Milk Laboratory. The milk was ordered "modified" according to a written prescription. This added an exactness in feeding and a record of proportions found useful in this case.

The first prescription was:

℞. Fat	2 per cent.
Sugar	5 per cent.
Proteids	0.75 per cent.
Feedings	10 in number.
Amount in each	2 ounces.
Alkalinity	10 per cent.
Heated to 155° F. twenty minutes.	

This was fairly borne and the proportions were increased as follows :

℞. Fat..... 3 per cent.
Sugar..... 6 per cent.
Proteids..... 1 per cent.
Otherwise the same.

Flatulence, mucus, and curds indicated that the ingredients were not well borne. The proportions were changed to those of the first prescription.

After several days the symptoms were relieved and the prescription was changed again to the proportions in No. 2. From this point the ingredients were gradually increased to :

℞. Fat..... 4 per cent.
Sugar..... 7 per cent.
Proteids..... 2 per cent.
Alkalinity..... 5 per cent.
Feedings..... 5 in number.
Amount in each..... 6 ounces.
Heated to 155° F.

The writer has seen six cases of undoubted typhoid fever in patients of two years and under, viz., nine, thirteen, sixteen, twenty-two, and twenty-four months of age, and would conclude—

1st. The diagnosis in all these cases was easily made on signs and symptoms characteristic of typhoid in adults.

2d. The cases were all intimately associated with others in the family.

3d. Scepticism should be encouraged concerning any diagnosis of typhoid fever in an infant (under two years of life) not intimately associated with other cases.

4th. The most common mistakes arise from misnaming as typhoid the following diseases : grippe, subacute catarrhal enteritis, central pneumonia, and malaria.

IX.

A CONTRIBUTION TO THE SURGERY OF THE TESTICLE.

By Ellsworth Eliot, Jr., M.D.

Inflammation of the testicle is of frequent occurrence. It varies according to the type, in that it may be of gonorrhœal origin, or, on the other hand, the result of syphilitic or tubercular infection.

Simple inflammation may be acute, subacute, or chronic; in the majority of cases the epididymis alone is involved; exceptionally, the process extends to the testicle proper. Resolution takes place in almost all cases; occasionally tissue necrosis results, and, after the evacuation of the pus, sinuses form, which, by their persistence simulate a tubercular process.

Case I.—This was an example of this unusual type. O. S. B., aged twenty-nine; admitted July 15, 1895. A brother died of phthisis. Patient has always enjoyed good health. No syphilitic or gonorrhœal history; no history of pulmonary or joint tuberculosis.

Four years ago, patient's testicle was caught in a spring and injured; for two weeks afterward symptoms of orchitis developed, and then subsided. About a year later, he noticed the same testicle somewhat enlarged and painful; this condition has increased and decreased from time to time, but for the past three months it has been enlarged and hard, and about three weeks ago a sinus formed, which has since been constantly discharging.

On examination the left scrotum is swollen to three times its normal size. In the skin, inferiorly, are several sinuses, discharging small quantities of laudable pus. On palpation, the swelling is found to consist of both testicle and epididymis, the sinuses being situated over the former structure. The vas deferens is slightly thickened and not tender or beaded. Testicular sensation is diminished. The skin in the neighborhood of the sinuses is adherent to the organ and is reddened and thickened. The urine is normal.

Operation.—Ether ; elliptical incision, including the skin adjacent to the sinuses, five inches in length, extending from the external abdominal ring, parallel to the cord, inferiorly. The testicle and cord exposed and enucleated in the usual way ; the latter, found to be of healthy appearance but thickened, was drawn out by "avulsion," breaking off three inches within the canal. The cord was ligated with catgut and severed at the level of the external abdominal ring. Continuous silk suture, sterilized dressing.

Primary union was obtained, and patient was discharged at the end of two weeks, cured.

PATHOLOGIST'S REPORT, BY DR. G. A. TUTTLE.

"On microscopical examination, the process resembles the changes of ordinary inflammation. There are necrotic and granular areas, but no evidence of tubercle tissue or giant cells. No tubercle bacilli found. *Vas deferens:* the lumen is very small. Epithelium is detached. Wall somewhat thickened and very dense. No appearance of tuberculosis."

With the subsidence of an acute attack of epididymitis in resolution, all swelling usually disappears ; in a number of cases, a small nodule in the upper part of the epididymis persists. This is composed of connective tissue and may become the seat of calciferous degeneration, or, at times, probably leads to the development of neoplasm, as in Case VII.

The following is the history of a patient, in which after an inflammatory process, the epididymis became converted into tissue so hard, that sections of it were difficult to make.

Case II. Chronic Calciferous Epididymitis.—J. K., aged thirty ; married ; entered hospital August 7, 1898. No family history of tuberculosis. Denies ever having had syphilis. Patient has had two attacks of gonorrhœa, the latter ten years ago, complicated by epididymitis. At this time, the right testicle became swollen. The swelling was soft, slightly tender, and accompanied by some dragging pain in the groin. Six months after the onset of the swelling the scrotum was tapped, and a bloody serous fluid withdrawn. A reaccumulation of the fluid necessitated five or six tappings in the course of the next eighteen months. Subsequently patient paid very little attention to the scrotal difficulty until a year ago, when

the recurrence of the dragging pain began to annoy him, and he then noticed that the right testicle was much harder than normal. During the past year, the testicle has slightly increased in size, and at times there has been pain in the right lumbar region. He has lost ten pounds, and some strength. At the present time, his condition is excellent. The urine is normal.

On examination the right epididymis is double the size of its fellow, and is stony hard in consistency. The surface is smooth but lobulated. The overlying skin is freely movable. The testicle is almost completely surrounded by the epididymis ; a small portion of it, felt anteriorly, is of normal consistency. Testicular sensation is absent in every part of the organ. The cord is apparently normal. A slight enlargement of the right seminal vesicle is felt through the rectum. The left testicle, epididymis, and cord are normal.

Operation.—Ether. Incision along the cord from a point below the external abdominal ring to the testicle, which together with its cord were enucleated in the usual manner. The cord was tied with heavy catgut ligature. The vas deferens was unchanged. Skin brought together with a continuous silk suture. Ordinary dressing.

The patient's convalescence was uninterrupted, and primary union was obtained, the patient leaving the hospital after the expiration of two weeks.

PATHOLOGIST'S REPORT, BY DR. G. A. TUTTLE.

" The epididymis is stony hard, and evidently the seat of calcareous deposit. It is impossible to divide it with a knife, and it is only with difficulty that a section can be made through it with a metacarpal saw. The testicle is almost enveloped by the epididymis ; it is soft and very much atrophied."

The clinical course of tuberculosis of the testicle is so well known as to need no mention. Case III. is one in which castration effected a cure, the disease appearing subsequently in the opposite testicle. Unfortunately the patient disappeared from observation. Case IV. is one of tubercular epididymitis, in which the diagnosis was uncertain until substantiated by operation. The general condition of the patient had been, and at the time of examination was still, excellent, and the process resembled more that of an epididymitis in

which resolution had been delayed rather than a tubercular one. Attention is directed, however, to the fact that the skin of the scrotum was adherent to the lower part of the epididymis. This should always excite suspicion of tuberculosis, as, in the absence of a syphilitic history, such a symptom could only occur in those very unusual cases of simple suppurative epididymitis, of which Case I. is an example. Case V. is very interesting in that it relates the history of a patient who suffered from a bilateral tubercular inflammation of the testicle, which gradually subsided, notwithstanding the unsatisfactory environment in which the patient was compelled to live. The histories of these three cases follow.

Case III.—S. C., aged thirty-eight; August 2, 1898. Patient denies syphilis and gonorrhœa. For the past eighteen years he has had a bad cough. Three or four times a year he has had hæmoptysis after a paroxysm of coughing. Five weeks ago the left testicle became swollen and a little tender, since which time his appetite has suffered; he has been unable to sleep, and he has felt poorly. At present he says that the testicle is not tender, and he thinks it is not increasing in size.

On physical examination there is prolonged and high-pitched expiration over the apex of the right lung. The left testicle is hard and much swollen. The epididymis is much enlarged and smooth, and tends to surround the testicle; the surface is roughened. Testicular sensation is very much diminished. The cord is slightly beaded. There is no hydrocele. Rectal examination reveals nothing abnormal.

Operation.—Ether. A large incision was made from a point near the external abdominal ring to the base of the scrotum. The cord and testis were exposed in the usual way, and were removed together with that portion of the skin that was adherent to the epididymis. The vas deferens was then isolated from the cord, and by "avulsion," five inches of it were extracted from the inguinal canal and abdominal cavity. The cord was ligated with heavy catgut. Continuous silk suture, ordinary dressing.

The convalescence of the patient was uninterrupted, primary union being secured after the customary length of time.

Pathologist's Report.—The epididymis was much enlarged, and on section three drachms of tubercular-looking pus escaped. Testis enlarged and softened. Microscope shows characteristic tuberculosis of both testicle and epididymis.

After the patient left the Hospital his general condition greatly improved. He became much stronger, and his appetite increased. He gained both flesh and strength. At the end of a year he returned with a similar tubercular process, involving the right organ, but refused treatment. The eventual outcome of the case is unknown, as the patient could not be traced.

Case IV.—J. O'C., aged thirty-five; male; single; August 14, 1898. There is no family history of tuberculosis. Patient denies ever having had syphilis. About ten years ago patient had gonorrhœa. One year ago present trouble began with pain in the lumbar region, and a heavy dragging sensation in the right groin. After a week or ten days, the right testicle became swollen without the presence of pain or tenderness in the organ. An accompanying sensation was relieved by wearing a suspensory bandage, and at the end of three weeks the swelling had so far diminished that only a small hard nodule remained in the lower external side of the testicle.

Patient continued in good health until two months ago, when the dragging sensation returned and the tumor rapidly increased to double its size. There developed a dead dull pain in the testicle, and for the past two weeks the organ has been tender to the touch.

Three years ago the patient had frequent micturition for four months, urinating every half hour. With this exception, urination has always been normal. Patient's general condition has always been excellent. He is a very powerfully built man. He has lost no flesh or strength. His appetite has always been good.

On examination the right epididymis is enlarged to double its normal size, indurated, and of irregular surface. Over its central portion there can be detected a feeling of elasticity. It almost completely surrounds the testicle, a small portion of which can be felt anteriorly of normal consistency. The testicular sensation over the epididymis is very considerably diminished; that over the testis is normal. The entire organ is tender on pressure. The skin overlying the inflamed epididymis is slightly reddened and adherent to its lower portion. The right cord is a little swollen but not nodular. Through the rectum, the right seminal vesicle can be felt enlarged, nodular, and tender. No changes can be detected in the prostate. The left testicle, cord, and seminal vesicle are normal. Physical examination of the chest detects no changes in the heart or lungs.

Urine.—There is a faint trace of albumin; otherwise it is normal.

Operation.—Ether; incision from the external abdominal ring, parallel to the cord, embracing below the adherent patch of skin. The cord, on macroscopical examination, was normal. It was ligated with heavy catgut at the level of the ring, and together with the testicle and the tunica vaginalis was enucleated from the tissues of the scrotum, without the escape of any pus from the damaged organ. Continuous silk suture.

After the operation the albumin in the urine increased from a trace to one per cent. (by volume). A few casts, hyaline and granular, also appeared. There was no other evidence of kidney trouble, and shortly afterward the urine resumed its pre-operative condition. Primary union was obtained throughout the greater part of the wound.

PATHOLOGIST'S REPORT BY DR. TUTTLE.

"The epididymis is tubercular as well as the adjacent part of the testicle. The ducts are much dilated, with sloughing walls, and pus and cheesy matter are seen in their lumina. There is a small abscess in the testicle, filled with thick, creamy pus. Microscopical examination shows the evidences of usual tubercular inflammation."

Case V. Tubercular Testis.—P. E., aged fifty-five; June 12, 1896; North Brother Island. Family history negative; has had eight children by first wife, the last fifteen years ago. Two years ago he married a second time, and there has been no issue by this marriage.

When thirty-five patient had lung inflammation of two months' duration, recovery being complete. Patient had gonorrhœa twenty years ago, recovery being complete.

Eighteen months ago, without known cause, the right testicle became sore, the pain extending up the right inguinal canal. This pain, constantly present, was of a mild boring character; a few days later soreness had appeared in the left testicle, and several days after the appearance of the soreness, both organs became increased in size, the swelling being gradual, so that it required one month for the right, and one month and a half for the left organ to double in size. At the end of this time both swellings opened spontaneously, discharging a considerable amount of pus, sinuses resulting and persisting. These sinuses have been practically closed for the past eight to nine months. With the discharge of the pus, the soreness

disappeared and both swellings returned to their normal size. The pain in the right inguinal region, however, persisted after the pus had been discharged through the scrotum, and in about four months after the initial symptom, patient noticed a swelling in the right inguinal region, which gradually increased in size to that of a hen's egg; this was red and painful, the pain being relieved somewhat by walking. In one month it had ruptured, discharging a considerable amount of pus, and in three months the sinus had entirely closed. During this entire period the general condition of the patient remained excellent; there was no loss of flesh or strength. With the closing of the sinus, the patient considered himself entirely well, and remained so until about three weeks ago, when the left inguinal region became the seat of a swelling, painful, relieved by walking, and situated nearer the median line than had been the case with the swelling on the opposite side. In other respects the patient is in quite a normal condition, there being no evidence of tuberculosis elsewhere in the body. Examination of the urine negative.

On examination, there is found between the right anterior superior spine and the symphysis pubis, just above Poupart's ligament, and nearer the inner extremity of the inguinal canal, a cicatrix, corresponding to the point of rupture of the primary swelling. On the left side, in a similar position, is found a swelling, oval in shape, with its long axis parallel to Poupart's ligament, its surface smooth, distinctly fluctuating in character, with the skin slightly reddened over it. At the base of the scrotum, on either side of the median raphé, are seen the orifices of several sinuses, from which a few drops of pus may be made to exude, which lead directly to the underlying organ; the skin in the immediate vicinity is adherent to the testicle. Both organs are somewhat diminished in size, with an irregular and very nodular surface, as if they contained a considerable amount of cicatricial tissue. The greatest amount of hardening is to be felt in either epididymis. There is diminished testicular sensation on both sides. The right cord is thickened and beaded in character; the left cord is apparently normal. The finger in the rectum detects a nodular and thickened prostate, and an enlargement of the left seminal vesicle. There is no evidence of vesical irritation.

July 10. Ten days ago the fluctuating swelling in the left inguinal region opened spontaneously, discharging a considerable amount of thick cheesy matter. The amount of discharge has stead-

ily become less. A dressing of iodoform ointment was applied and the patient given a mixture of cod-liver oil and the hypophosphites.

July 25. Since the last note, the discharge has entirely ceased. At no time has it been necessary for the patient to discontinue his work, which is that of an orderly in an infectious hospital. The patient is directed to continue the internal medication.

June 16, 1897. Since last note, the patient has remained entirely well, and has gained considerable strength. Five months ago, the patient's wife gave birth to a healthy male child. Patient still continues to take the internal medication.

July 1, 1899. Since last note patient has been in excellent health. At this time the finger in the rectum detects nothing abnormal. The epididymis on both sides is the seat of a hard nodular mass, which is not painful on pressure, and which is connected with the skin by a cicatricial band representing the path of the old sinus. The body of the testicle appears normal, as does the cord on either side. Testicular sensation has also been restored, and patient declares that he is perfectly well in every particular.

This patient undoubtedly had a bilateral tubercular inflammation of the epididymis, resulting in the partial destruction of that organ, and followed subsequently, first on one side and then on the other, by a tubercular inflammation of the glands in the iliac fossa. After a duration of eighteen months, there was found, when the patient first applied for treatment, besides the chronic suppurating tubercular testitis, a tubercular involvement of the tissues of the right cord, and evidence by rectal examination of a similar process in the prostate gland, and in the left seminal vesicle.

Under these circumstances, the partial recovery of the patient, and the continued power of at least one of the damaged testicles to perform its function is very remarkable, and demonstrates the value of palliative treatment, when radical measures are contra-indicated.

Such palliative treatment consists in placing the patient in a dry inland climate, which, on trial, seems to act as a tonic to the general system, and, in such an environment, in giving him a generous, nutritious diet. These measures of treatment may be reinforced, if it is considered advisable, by the administration of cod-liver oil and other tonics.

In the case under discussion, the financial outlay necessary to secure these advantages was an impossibility, and the patient was

obliged to remain at work, living on an island in the mouth of the East River, subject to every change of the weather, eating such food as usually falls to the lot of an orderly in a public hospital, taking regularly, however, generous doses of cod-liver oil and of the hypophosphites. Under such conditions, the marked improvement which took place must be ascribed either to an unusually active antagonism, inherent in the body-cell itself, to the tubercle bacillus, or to a low grade of virulency of the germ. It is the great variability of this ratio, which accounts for the almost endless manifestations of tuberculosis.

Of course, in the present instance, both organs must be considered permanently damaged, although one at least is capable of manufacturing and discharging into the urethra, healthy spermatozoa. It is also possible that at any time a relapse may take place, for, although, in its present healed condition, the foci of tubercular inflammation in the testicles, the cord, the prostate, and the seminal vesicles are all surrounded by a wall of connective tissue, thus effectually imprisoning and rendering inactive the tubercle bacilli, yet if, at any time, the restraint of this barrier should be removed in any place, the tubercular process might quickly become active in its former site or at a distance from it in some other part of the body. This connective tissue barrier, so desirable to establish in those cases where the tubercular foci cannot be removed by the surgeon's knife, en masse, invariably prevents the spread of the disease as long as it remains intact.

Radical treatment in tubercular testicle is indicated in all cases where the tubercular foci can be removed in their entirety. It consists in the removal of the foci from the diseased organ, leaving the healthy portion in the scrotum, or in castration, removing as much of the cord as can be reached through the external incision; and in cases where the disease is more extensive, the removal of the proximal portion of the cord, of the damaged seminal vesicles and of the prostate through a perineal incision is adopted by some surgeons. Whatever the particular method followed, it is necessary to emphasize the necessity of exercising every precaution to prevent a recurrence of the disease in some other part of the body.

In certain cases, where the disease cannot be entirely removed by one or other of these procedures, the judgment of the surgeon is often obliged to decide the question of the advisability of a partial

operation. This may be done, for example, in those cases where the condition of the patient is such that, by the removal of a tubercular testicle, the general system will be better able to cope with an accompanying lesion of the lung. Generally speaking, the less the amount of tubercle tissue, the more easily is established a reparative process that brings the disease to a standstill. Frequently, this question is very difficult to decide, especially when both testicles are involved. The results from a double castration are not such as to encourage this operation.

Case VI. Volvulus of the Spermatic Cord.—This case is one of torsion of the cord, which seems to have been the result of violent coitus. These cases are rare, and from the character of the symptoms are at times mistaken for strangulated hernia. This is a very excusable error in those cases in which the torsion is in the limits of the inguinal canal. In the present instance, the point of torsion was a short distance below the level of the external abdominal ring, so that a strangulated hernia could easily be excluded.

The symptoms upon which an accurate early diagnosis might have been made, comprise the sudden advent of severe pain after unusual exertion, followed by rapid swelling of the organ, and on examination, the most prominent feature seems to have been the sharpness of the line of demarcation between the turgid and swollen cord below, and a shorter normal segment above.

The case is also of interest, in that there was found a painful swelling of the prostate, which subsided after the operation.

Case VI. H. S., aged twenty-three ; single ; October 29, 1896. Twenty-four hours ago, patient, who has always been healthy and free from all kinds of venereal disease, indulged in violent coitus ; three hours afterward, patient noticed a sharp severe pain in the right testicle, which shortly afterward became swollen. On attempting work, the following day, patient was unable to accomplish anything, and thirty-six hours after the initial symptom sought relief because of the pain.

On examination right scrotum is the seat of swelling extending from just below the external abdominal ring to the bottom of the sac ; it is pear-shaped, and the skin over it is reddened but not adherent. On palpation, the testicle is found to be soft and almost surrounded by an umbrella-shaped epididymis, with sharply defined edges ; this latter organ is hard, firm, extremely painful on

The convoluted cord, epididymis, and testicle is seen below the tunica vaginalis, through a window, in which the stump of the viable portion of the cord is visible. The twist in the cord is situated just below the reflection of the tunica vaginalis.

pressure, and is lost in the thickened cord above. The cord is rounded, elastic, and evenly swollen, presenting a diameter of at least one inch. There is a sharp line of demarcation between the swollen cord below and the normal cord above, about one half inch below the external abdominal ring. There is no impulse on coughing. On rectal examination, the prostate is found markedly enlarged and tender. Examination of the urine, normal. Patient put to bed and poultices applied.

October 30. Swelling has not subsided ; pain still marked ; the outline of the epididymis is not so sharply defined. There has been no pulse or temperature elevation since the beginning of the attack.

November 4. There is practically no change in the patient's condition ; the swelling is a little softer, and the skin overlying the epididymis is slightly adherent, but shows no evidence of pointing. Because of the persistence of the pain and the swelling, patient is advised to have an exploratory incision.

Operation.—Ether. Incision over the tumor in the scrotum, three inches in length, and carried down to the transversalis fascia ; under this the cord was markedly tense, swollen, and discolored by blood extravasation ; the tumor below was dark-colored. The cavity of the tunica vaginalis was then opened and was found to contain a small amount of bloody serum with some clot. The testicle was dark-colored, the epididymis, however, absolutely black, the tunica albuginea accounting for the difference in color. The cord extending up from the epididymis presented a similar appearance ; just above the reflection of the tunica vaginalis the cord was twisted on its vertical axis through three hundred and sixty degrees. Above this point the cord was normal.

A long incision in the epididymis, which was treble the ordinary size, revealed a condition of infiltrated blood-clot, and did not bleed. Puncture of the testicle also provoked no hemorrhage. There was slight odor. Owing to the evident necrosis, castration was performed, removing the testicle, the tunica vaginalis, and the cord above the point of constriction. Silk suture, small drain for seventy-two hours.

Primary union was secured, the convalescence of the patient being uneventful. Four days after the operation, rectal examination disclosed the fact that the swelling and the tenderness of the prostate had subsided.

Although frequently attacked by some form of acute, subacute or chronic inflammatory process, the testicle seems to enjoy a relative immunity from neoplasm, especially of the malignant variety.

This is particularly the case when the organ has descended from the abdominal cavity to the bottom of the scrotum, and subsequently has developed in a normal fashion. On the other hand, undescended testicles, or organs where there has been an arrest of development, or rudimentary testicles, all offer a suitable soil for the growth of malignant neoplasm.

The following cases of sarcoma are, therefore, of particular interest, in that so far as could be ascertained the process involved fully developed organs, and they are also of interest, in that they furnish some information in regard to the clinical course of this rare disease.

Case VII. Sarcoma of the Testis.—O. F., aged thirty-seven ; single ; barber ; July 10, 1899. Previous history negative. Twelve years ago patient had an attack of gonorrhœa, which was complicated by epididymitis for one week, when it subsided, leaving a permanent increase in the size of the organ. Patient denies ever having had syphilis or any tubercular lesion.

Nine months ago patient noticed a swelling of the right scrotum, which has gradually increased in size up to the present time. There has been a feeling of discomfort without actual pain. Patient is unable to say whether the swelling began in the upper or lower part of the scrotum. At present the patient complains merely of the inconvenience of a tumor.

Examination reveals a swelling, pyriform in shape, situated in the right side of the scrotum. It is about the size of an orange, with the fulness below ; it is elastic, moderately tense, and translucent. Below, the testicle is indefinitely felt, and appears considerably enlarged. It is not sensitive on pressure. The vas deferens is unchanged. Rectal examination detects nothing abnormal in the prostate or the seminal vesicle. The inguinal glands are not perceptibly enlarged. There is no evidence of abdominal swelling.

July 12. Through an incision made under ether, about three ounces of bloody fluid was evacuated from the cavity of the tunica vaginalis, the wall of which was thickened and had the appearance of unhealthy granulation tissue. At least one half of the swelling was composed of the enlarged testicle, all parts of which were evidently incorporated in the tumor, although it was impossible to ac-

curately distinguish the line of separation between the epididymis and the testicle, owing to the thickened tunica vaginalis. A section of this thickened wall was taken for microscopical examination and the usual dressing applied, the wound being left open.

July 19. The swelling is found to be a part of a large round-cell sarcoma.

During the past week the swelling has rapidly increased to double its previous size; the edges of the wound are everted, sloughy, moderately indurated, and adherent to the surface of the underlying tumor. The discharge is bloody and abundant.

The patient has had moderate fever, the temperature varying between 100 and 102.5° F.; the pulse between 90 and 100. The general condition of the patient has visibly deteriorated during the past week.

Operation.—Ether; a typical castration was performed, removing the entire tumor, and with it the vas deferens as high as the external ring and the overlying skin. The hemorrhage was considerable, but was easily controlled by ligature. Continuous suture, a small drain being inserted for thirty-six hours and then removed.

August 1. Primary union throughout; slight rise of temperature for four days after the operation; since then the temperature and the pulse have been normal. The general condition has materially improved. Patient feels entirely recovered.

Case VIII. Sarcoma of the Testis.—H. V. S.; married; aged thirty-eight; July 9, 1899. Patient denies venereal trouble of any kind at any time. The left testicle has always been on a higher level than the right, never having completely descended into the scrotum.

Four months ago patient received a blow on the left testicle; the inguinal glands and the cord above testicle became swollen and tender, but no change was noticed in the testicle itself until three weeks ago, when the organ became tender and swollen, the patient experiencing considerable pain. Patient has been in bed since without any benefit to the swelling, but with alleviation of the pain. There has been no evidence of the breaking down of the tumor.

Physical examination of the chest reveals the presence of well-marked signs of chronic bronchitis and emphysema, from which the patient has suffered for the past fifteen years.

The lower part of the inguinal canal and the upper half of the scrotum is the site of a swelling involving the testicle, epididymis,

and the cord on that side; it is pyriform in shape, being fuller below, and is uneven in consistency, the epididymis being soft, while the testicular portion is firm. The surface of the tumor is smooth and it is slightly sensitive on pressure. The overlying skin is normal and non-adherent. In appearance the swelling strikingly resembles an irreducible hernia. There is, however, no impulse on coughing, and the size of the tumor is always the same. Rectal examination of the prostate and the seminal vesicles gives a negative result. There are no constitutional symptoms and there has been no loss of flesh or strength. A diagnosis of traumatic epididymitis and orchitis was made, and the patient was kept quiet in bed, flaxseed poultices being applied to the part for four days without benefit or change. At the end of that time patient desired, before submitting to an exploratory incision, to try the effect of electrical treatment. At the end of another week the character of the swelling had remained unchanged, notwithstanding the daily application of electricity.

Operation.—July 21. Chloroform; incision, three inches in length, over the lower part of the inguinal canal and the tumor; the cord and testicles were exposed in the usual way. The epididymis was found to be double the usual size, and incision into its structure disclosed the presence of a softened yellow area, that on inspection looked tubercular. The entire organ and cord were then removed, the lower part of the inguinal canal being exposed by the division of the aponeurosis. The parts were brought together with continuous silk sutures; the recovery of the patient was uneventful, the wound healing primarily.

MICROSCOPICAL EXAMINATION BY DR. TUTTLE.

"There are considerable areas of tissue in both epididymis and the testis proper that are made up of cells of large nuclei, spindle in shape, with very little cell body. There are many mitoses. There are also bands of dense connective tissue, a large necrotic area, and some scattered spots that do not stain."

Case IX.—J. C., aged thirty-nine; married; cigar-maker; November 9, 1899. Patient was an applicant for treatment at the Vanderbilt Clinic, with the following history. Family history negative. Patient had a chancre of the penis sixteen years ago; denies ever having had gonorrhœa. No history of traumatism.

Seven years ago, left testicle began to increase slowly in size. This continued until one year ago, when the organ was double the size of its fellow. During the past year it has grown very rapidly and has again doubled in size. About five years ago, testicular sensation began to disappear ; it is entirely gone at the present time.

A year and a half ago, a tumor appeared in the left supraclavicular region, gradually increasing in size, until now, a mass the size of an orange is distinctly seen above the middle of the clavicle. During the past fourteen months patient has lost fifteen pounds in weight.

Two months ago, patient says that the testicle was tapped and bloody fluid withdrawn. Shortly after castration was performed in one of the hospitals of this city.

On examination there is a linear cicatrix, about four inches in length in the left scrotum. Otherwise the scrotal inguinal regions, and the region of the inguinal canal, are normal. The abdomen is the seat of a large extensive mass in the umbilical and both lumbar regions, connected with the liver above, apparently consisting of enlarged retroperitoneal glands. The left side of the neck is the site of a swelling the size of an orange, extending from the clavicle below, to and under the sterno-mastoid above, reaching two-thirds of the way to the mastoid process. This swelling, hard in some places, elastic in others, is lobulated and very slightly movable on the vertebral column. The skin over it is normal and movable. The patient's general condition is good. He is moderately strong and able to work.

Microscopic examination of a section removed, showed the tumor to be a small round-cell sarcoma. The general distribution of the tumor precluded the possibility of an operation.

Case X. Sarcoma of the Testicle.—P. S., aged forty ; married ; laborer; November 10, 1898. The intelligence of this patient was so poor that an accurate history of his past could not be obtained.

Patient denies any previous venereal difficulty, and says that, six months ago, his attention was attracted to the left testicle by the advent of pain, and that he then noticed that the testicle was enlarged. Since that time it has doubled in size.

About three months ago a similar swelling appeared in the right testicle ; this has run a similar course and has increased one-half in size.

On examination the left testicle and epididymis are the seat of

a pyriform swelling, larger below than above, involving the entire organ, the epididymis being, however, larger proportionately than the testis proper. The swelling is firm in consistency, not painful on pressure, and the surface, to which the skin is not adherent, is smooth. There is loss of testicular sensation. There is a small amount of fluid in the tunica vaginalis, which does not interfere with the palpation of the organ. The left cord is normal. The left inguinal glands are not enlarged. The right testicle is the seat of a similar swelling, about the size of a small lemon, and with the same peculiarities as on the left side. There is no fluid in the cavity of the right tunica vaginalis. The right cord is normal. There is no enlargement of the right inguinal glands. Rectal examination reveals no change in the prostate or in the seminal vesicles. On abdominal examination there is a distinct mass, lobulated in character, situated below the level of the left kidney, to the outer side of the rectus abdominis, above Poupart's ligament. This mass is evidently composed of several retroperitoneal glands, is of firm consistency, of smooth surface, and is slightly movable up and down behind the peritoneal cavity.

The general health of the patient is excellent, and his only complaints are moderate pain, and the inconvenience of the tumor. Treatment by local inunctions of mercury, and mixed treatment, the latter in gradually increasing doses.

November 17. This morning, while stooping to pick up a basin of water, patient felt a sharp pain in scrotum, and noticed that the testicle rapidly grew much larger, the skin over it becoming diffusely blue. Shortly after the attack patient felt very weak and faint.

On examination the right testicle is unchanged. The left scrotum is the site of a large hæmatoma, the size of a large cocoa-nut, which has involved the tunica vaginalis, the skin, the subcutaneous tissue, and the tissues of the cord; this latter structure forms a large rounded mass, extending up to and through the external abdominal ring into the lower part of the inguinal canal. Treatment by rest in bed; ice-bag applied to the scrotum, and the patient placed on a fluid diet, the same internal medication being continued in increasing doses.

December 2. The extravasation of blood has gradually diminished as a result of local applications. Needle puncture of the tunica vaginalis discloses bloody serum, the withdrawal of which diminishes

but slightly the size of the tumor ; this has perceptibly increased in size during the past two weeks, and the left cord seems now to be permanently enlarged and thickened. The tumor of the right testicle has also increased in size, but not so rapidly as the left, retaining its previous characteristics.

December 15. To-day, several small metastases are observed for the first time in the skin and subcutaneous tissues of the wall of the thorax and the left axilla. These are firm in consistency, about the size of a pea, movable on the deeper parts but incorporating the skin, which has a reddened surface, giving the growth an inflammatory appearance.

January 3. One of the smaller of these metastases was recently excised and subjected to microscopic examination, which showed that the tumor was a small round-cell sarcoma.

During the past two weeks the metastases have increased in both size and number, the cavity of the tunica has again filled with fluid, and the retroperitoneal glands are more distinct and much more easily felt.

The general condition of the patient has become weaker. During the time in which he has been kept under observation he has had a temperature varying from normal to 102° F., with a pulse corresponding in rapidity. At his own request he leaves the hospital, unimproved.

Analysis of these cases furnishes some information in regard to the etiology. In Case VII. there is a history of an epididymitis following an attack of gonorrhœa, twelve years before the appearance of the tumor ; the patient says that a nodule could always be felt after the inflammatory process had subsided. In Case VIII. the testicle had never reached the bottom of the scrotum, being situated just below the external abdominal ring ; there is also a history of a trauma received several months before the presence of the tumor was noticed. In Case IX. there is a history of a tumor slowly increasing in size for six years ; in the seventh year it grew very much more rapidly and doubled in size ; this corresponds to the history of a benign growth becoming malignant. In Case X. the previous history is obscure, owing to the defective intelligence of the patient.

In Cases VII., VIII., and IX., the tumor was unilateral ; in Case X., bilateral.

The invasion in every instance seems to have been insidious, the tumor reaching a considerable size before attracting the attention of the patient. Case VII. gave the history of a hydrocele, and the physical examination was not unlike that condition, the cystic tumor being translucent. In Case VIII., owing to the large size of the tumor when first noticed, a diagnosis of an inflammatory process was made. In Case X., at first, the diagnosis of a syphilitic affection was considered probable.

In regard to the origin of the growth, as far as could be learned by examination of those cases in which no operation was performed, as well as those cases where we had the evidence of the organ removed, the epididymis seems to have been the starting-point of the disease.

The shape of the tumor seems to have been constantly pyriform, with the larger portion below.

The consistency in all cases was moderately firm if not elastic; generally the consistency varied in different parts of the tumor.

In none of these cases was the skin over the enlarged testicle involved; freely movable upon the overlying structures, the enucleation of the growth was easily accomplished, and the cicatrix seems to have been invariably free from recurrence. Only when the overlying skin becomes incorporated with the tumor must involvement of the femoral, inguinal, or iliac glands be expected.

In Cases VII., IX., and X., there was diminished or lost testicular sensation.

In each case, the tunica vaginalis was found to contain a variable amount of bloody fluid. In Case X., which, from the type of metastasis as well as from the rapidity of the growth of the sarcoma, must be regarded as the most malignant, there occurred the rupture of a large-sized vessel in the scrotum, with the formation of an extensive hæmatoma. This was followed by an increased rapidity in the growth of the tumor.

In regard to the spread of the disease, Cases VII., VIII., and IX., seemed to be identical, in that the vas deferens showed no change; in Case X., in the latter part of the disease, the left cord, infiltrated by the blood from the ruptured vessel, seemed eventually to become invaded by the sarcomatous tissue. In all four cases there was no involvement of the prostate gland or of the seminal vesicles.

Cases IX. and X. present similar features, in that the retro-peritoneal glands were involved while the femoral, inguinal, and iliac glands escaped. This latter group of glands are only involved when the skin or dartos overlying the tumor or inflammatory process become invaded by the disease; as long as the process is confined to the testicle proper, the sarcomatous elements are invariably carried along the lymphatic vessels of the cord, not passing through any lymphatic glands until those in the retroperitoneal space are reached. This corresponds to the description of the lymphatic arrangement of the testicle as published by Most in *Virchow's Archives*, Bd. CLIV., Hft. 138, of which the following is an abstract. It will be noticed that, with slight exceptions, it is the arrangement also described by Sappey.

"The testicle is very richly supplied with lymphatic vessels, which leave the gland with the spermatic cord, and after forming a group of from four to six larger vessels pass, without either giving or receiving branches, through the inguinal canal to and behind the peritoneum, as far as the inferior pole of the kidney, when, turning internally, they shortly after enter the first lymphatic glands. These, from two to four in number, lie on the left side, near the aorta, on the right, directly upon the inferior cava. Behind these vessels there is situated a lymphatic plexus with glands, reaching below to the bifurcation of the aorta, above to the vicinity of the receptaculum chyli. These glands can be injected from the testicle. The exit of lymph from this territory takes place in vessels which travel up behind the inferior cava and the aorta as well as in front of the vessels of the left kidney, to open into the receptaculum chyli."

In two cases where excision of these sarcomatous glands has been attempted by the continental surgeon, they have been found adherent to the larger blood-vessels; the patient did not survive the shock of the operation.

In the majority of cases of sarcoma, irrespective of situation, metastasis occurs through detached portions of the tumor being carried by the blood current to distant parts of the body. In sarcoma of the testicle this seems to be the marked exception, transmission of the disease through the lymphatics being almost inevitable. In Case X., only, did metastasis appear in the skin and subcutaneous tissue, and then only after the retroperitoneal glands had become involved.

After this group of glands has become involved, the subsequent progress of the growth seems to take place along the thoracic duct to the neck. In Case IX., the sarcomatous supraclavicular glands developed on the left side, pointing to this mode of transit.

In Cases IX. and X., the general health and strength were not impaired until the latter part of the disease. Both patients continued to work until the retroperitoneal glands had become enlarged. In Case IX., in fact, until after the supraclavicular glands had become invaded. Pain interfering with sleep and gradual loss of appetite mark the onset of rapidly progressing emaciation, the termination of the disease coming shortly afterward.

The history of sarcoma of the testicle seems to coincide with the history of malignant tumors generally, in that they reach a considerable size before attracting the attention of the patient. This is all the more deplorable in sarcoma of the testis, in that when first noticed, the retroperitoneal glands have already become invaded, and castration does not save the life of the patient. In the six cases reported by Most, all died subsequently of the disease. In the four cases herewith reported, two were inoperable when the patient applied for treatment; in Cases VII. and VIII., the patients have thus far been free from recurrence, although, of course, sufficient time has not elapsed since the operation to insure a permanent cure.

X.

A RARE FORM OF DISLOCATION OF THE TARSUS.

By Ellsworth Eliot, Jr., M.D.

J. C., aged forty-five, entered the hospital, September 8, 1897. Yesterday morning the patient fell from the pole of his wagon, and, in falling, his right foot became entangled in a chain, giving it a severe wrench. Patient succeeded, however, in catching his balance on the other limb. Immediately after the accident, he suffered from severe pain in the vicinity of the injured ankle, and was unable to bear the weight of his body on that side. On the following day he was admitted to the hospital.

Examination Under Ether.—There is much swelling and ecchymosis over and on the outer side of the right ankle, extending upward into the lower part of the leg, and downward over the metatarsus. The ankle is in a position of mid-plantar flexion. The foot is in a position of supination, the outer margin being considerably nearer the ground than the inner, the angle of supination being about twenty degrees. The bony outlines of both malleoli are obscured by the swelling, but otherwise are normal. One inch above the external malleolus, and on a horizontal plane above its tip, is seen a rounded projection, joined by a constricted portion to a smooth surface behind, which, on palpation is found to be the head of the astragalus, continuous behind with its superior trochlear saddle-shaped articular surface. In front of the head of the astragalus is a depression, corresponding to the position of the navicular.

On palpation, in front of either malleolus can be felt the anterior portions of the corresponding smooth facets on the lateral surfaces of the astragalus. Between the bone and the os calcis can be felt a gap, especially well marked anteriorly. The tuberosity of the navicular can be felt in front of and below the head of the astragalus. On the outer side the bony prominences are in their normal relation to each other.

The long axis of the foot is apparently lengthened. Movement in the ankle-joint is markedly restricted, especially dorsal flexion. There is marked preternatural mobility, in that abduction and adduction are allowed, apparently between the astragalus and the os calcis, but no crepitus can be felt in carrying out these movements. The movement in the transverse-metatarsal joint is markedly restricted.

Operation: Ether. Inasmuch as the deformity resisted all efforts to reduce it, a curved incision was made a little anteriorly to the external malleolus, and directly over the head of the astragalus. The subcutaneous tissue contained considerable blood. The incision was deepened, exposing the head of the astragalus resting on the dorsum of the navicular, its body displaced anteriorly from its normal situation between the malleoli, and tilted upon itself, in that its anterior portion was on a higher level than its posterior portion, separated from the superior surface of the os calcis below by an appreciable interval. There was a well-marked false point of motion between the astragalus and the os calcis, due to a complete rupture of the interosseous ligament. Attempts to reduce the dislocation by ordinary traction and manipulation were futile, owing evidently to the interposition of a portion of the ruptured superior astragalo-scaphoid ligament between the two articular surfaces. By means of a hook this was lifted to one side, and then with a smooth curved periosteal elevator, the head of the astragalus was pried downward and backward into its proper position, the dorsum of the navicular being used as a fulcrum, while, at the same time, the tarsus was drawn forcibly forward. Coincident with the reduction of the head of the astragalus, the tilting of this bone disappeared as it resumed its normal relationship to the os calcis.

The parts were sutured together with catgut, after thorough irrigation with a sterilized salt solution, and the ankle immobilized with a plaster-of-Paris splint over a dressing of sterilized gauze.

The patient made an uneventful recovery, the parts healing by primary union. The immobilization was continued for six weeks, at the end of which time the function of the joint, except for slight stiffness, was entirely normal.

A dislocation of this kind must be extremely rare. They occur, only when the traumatism is of such a kind as to rotate the foot forcibly upon a vertical axis. Even under these circumstances, a

dislocation at the ankle is to be expected, for the capsular ligament of this joint, although strong, is much weaker than the interosseous ligament joining the astragalus and the os calcis together. This, in fact, is the strongest ligament in the body, with the possible exception of Bigelow's ligament of the hip, and necessarily so, as it has to support the entire weight of the superimposed body, thus preventing any abduction or adduction at the calcic-astragaloid joint.

The rupture of this ligament so thoroughly loosened the astragalus that its removal could readily have been accomplished. Reduction of this dislocation, even at the expense of converting it into a compound one, was certainly very much more to be desired than the removal of the astragalus. To be sure, this latter procedure yields good results, even when done in diseased conditions of the bone, but it is open to the objection that a permanent shortening of the leg necessarily takes place. Fortunately, the patient made an uneventful recovery, uncomplicated by sepsis, which might have been expected to occur after so much bruising of the tissues had taken place.

In the description of this dislocation, the nomenclature suggested by Otto Wendel,* has been followed. According to his classification, dislocations of the ankle and tarsus are divided into three different groups, as follows :

1. Dislocations forward and backward.

2. Pronation and supination dislocations (rotation of the foot on a horizontal axis).

3. Inversion and eversion dislocations (rotation of the foot on a vertical axis).

* Beitrag fur Klinische Chirurgie, V. 21, page 123 ff.

XI.

FUNCTIONAL RESULTS IN OLD FRACTURES AND DISLOCATIONS IN CHILDREN.

By Forbes Hawkes, M.D.

During the past year there have come into the Presbyterian Hospital Dispensary a number of old fractures and dislocations in children, where the original traumatism had occurred at an early age and where correct apposition of the separated articular surfaces and of the fractured fragments had evidently not been effected.

It has been a matter of interest to note that in spite of such unfavorable conditions and of a more or less marked resulting deformity, an excellent functional result in the affected limb has come about in the course of time in many cases.

The patient whose history is here recorded offers an excellent example of such condition. The amount of function in the injured elbow is noted in the history, and can be seen in part in the photographs; the exact positions of the displaced bones about the joint, as well as the mechanism of the new joint itself, are brought out in the radiographs.

N. H., aged thirteen; school-boy. When eighteen months old he fell from a height of several feet, landing on his left elbow. The injury was treated by plaster-of-Paris fixation for several weeks. After the cast was removed, and while playing in the street, he fell in the gutter and sustained slight additional traumatism to the same elbow. The arm was carried in a sling for awhile, and the boy then began to use his arm the best he could. Nothing has been done to it since. He can now use his left arm almost as well as any right-handed boy can do. He plays base-ball with the other boys (taking the position of first baseman), and he can lift a fifteen-pound dumb-bell to his shoulder with that arm. He does not complain of anything about it except the slight deformity.

Physical Examination shows a strong, well-developed boy. When both upper extremities are compared, the muscles of the left

forearm and arm are seen to be less well developed than those of the opposite side. When both forearms are extended, the outward angle between arm and forearm is seen to be smaller on the left side. The left upper extremity is shorter than the right. When both forearms are flexed, except for the lesser degree of muscular development on the left side, they are much alike.

Elbow Region.—In the extended position there is a distinct bony projection to the inner side of the elbow (the internal condyle); to the outer side there is a movable bony mass, of about the size of a large robin's egg, directly above and connected with the head of the radius, which, however, rotates independently of it. This movable bony mass on the outer side is situated considerably higher up than the level of the internal condyle. Behind, the olecranon process can be felt continuous with the ulna, which is displaced backward and outward. The head of the radius is in its normal relation to the head of the ulna, and rotates in its lesser sigmoid cavity with ease. When the forearm is flexed on the arm, the egg-shaped piece attached to the radial head is felt to move with it, and to take its place in full flexion behind and to the outer side of the humerus, one and one-half to two inches above the joint. Flexion and extension, passive and active, are made to their normal limit; there is evidently a new fibrous joint between the humerus and its fractured external condyle, which permits complete flexion and extension. Pronation and supination are also done to within a degree or so of their limit, the radial head rotating about normally in either motion, both on its ulnar articulating surface and on the fractured fragment of external condyle. It is the outward position assumed by the dislocated radius and ulna with the fragment of external condyle apparently, that permits the complete movement of extension at the elbow in this new joint, for the olecranon being to the outer side of the shaft of the humerus does not strike it before the motion is completed. Flexion is not interfered with by the fragment of external condyle, for it travels with the radial head in this motion past the axis of the humerus to its outer side. A more accurate apposition of the fractured surfaces, had it been followed (as was the case here) by non-union, would probably not have given the boy as good an arm as far as function was concerned, although the deformity would probably have been less, for the ununited external condyle would then have interfered much more with flexion, and the tip

FIG. 1.—ELBOW IN COMPLETE EXTENSION.

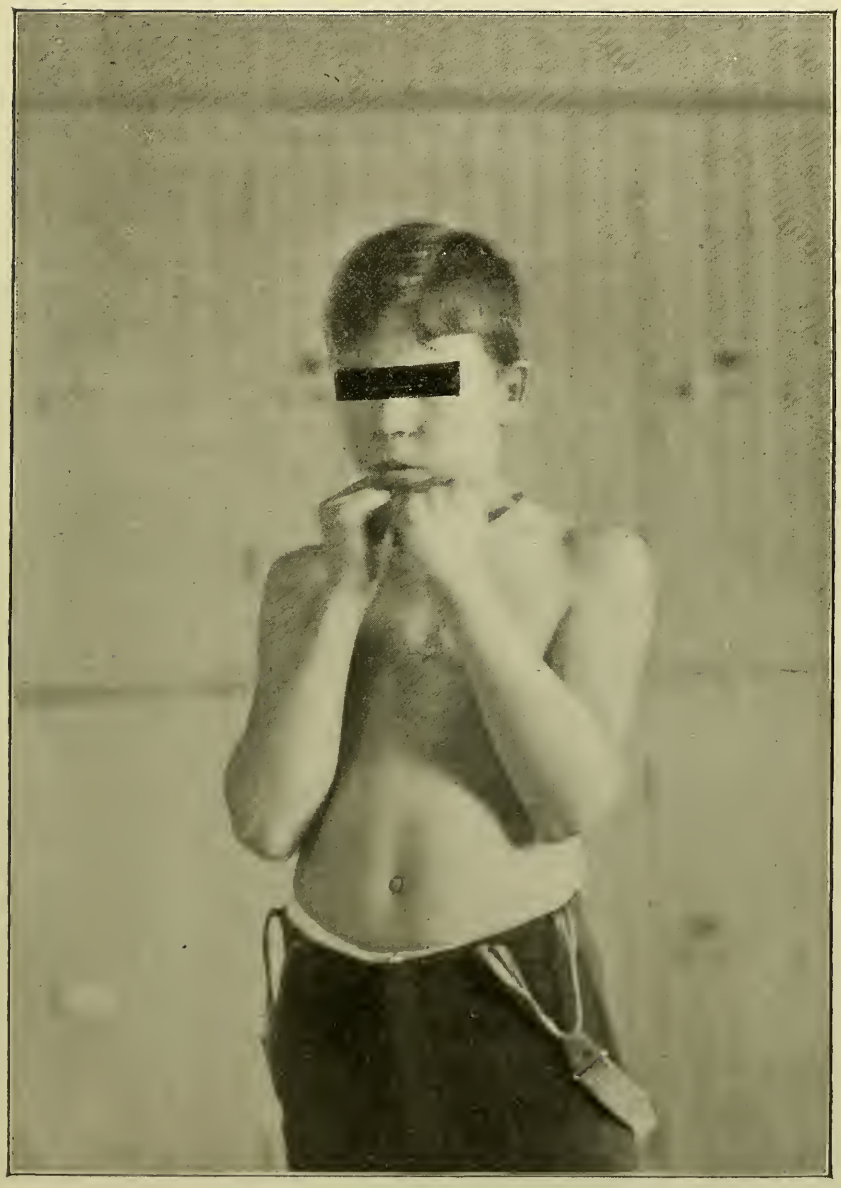


Fig. 2.—Elbow in Complete Flexion.

Fig. 3.— Elbow in Complete Extension.

FIG. 4.—ELBOW IN COMPLETE FLEXION.

of the olecranon process, instead of burying itself, as it normally does, in complete extension in the olecranon fossa of the humerus, would, in all probability, have struck against the shaft of the bone, and thus limited the motion considerably.

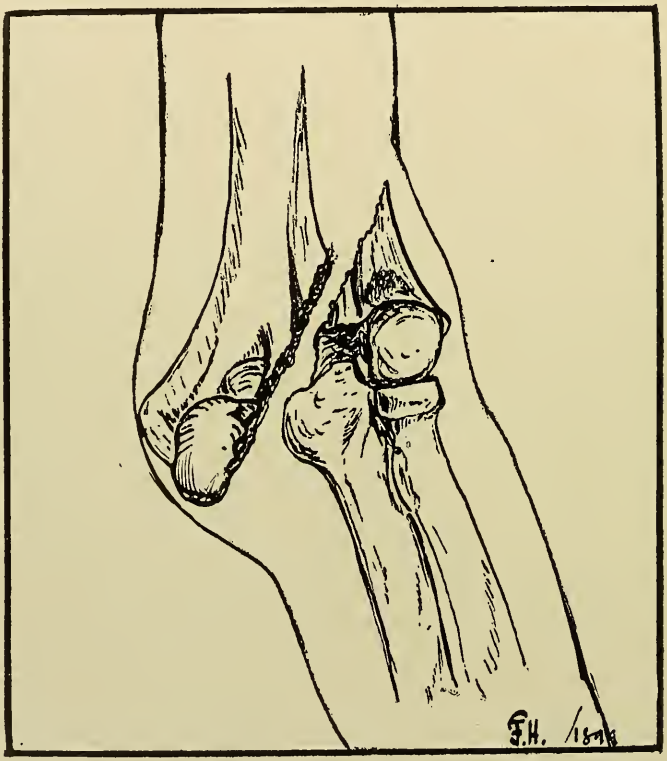


FIG. 5.—DIAGRAM OF ORIGINAL INJURY.

The tendency of tissues which have normally entirely different anatomical relations with one another to adapt themselves gradually in infants and children to the requirements of their new conditions, with the least amount of interference, is well exemplified in this case, for when we consider the amount of original displacement of the articular surfaces, due to the dislocation and to the oblique fracture of the lower end of the humerus, the present deformity, as reproduced in the accompanying photographs, can certainly be said to be a slight one, and the functional result remarkable.

XII.

REPORT OF TEN CASES OF SUBPHRENIC ABSCESS

Occurring in the Presbyterian Hospital during the last Seven Years, January 1, 1893 to January 1, 1900.

By Forbes Hawkes, M.D.

During the last seven years (January 1, 1893, to January 1, 1900) there have been admitted to the Presbyterian Hospital a number of patients suffering from inflammatory processes in the subphrenic region. Of these a certain number have developed localized collections of purulent fluid directly below the diaphragm, and have received appropriate surgical treatment therefor. It has seemed to the writer that a record of these cases would be of interest.

Owing to the comparatively thin dividing line between the lower part of the pleural and the upper part of the abdominal cavity it is not always an easy matter to distinguish between localized collections of pus in the adjoining portions of these two spaces, particularly before operation. On this account all doubtful cases have been excluded from this report and those only are recorded where the operative procedures revealed the existence of a pus-collection directly below the diaphragm in the so-called subphrenic space.

In all, ten cases of this sort are here collected.

Etiology.—The etiological factors were sought for in every case. The trouble was traced in 2 cases to an abscess of the appendix; in 2 cases to a cholecystitis; in 2 cases to an abscess of the liver; in 1 case to a nephritic or perinephritic abscess; in 1 case to an empyema; in 2 cases the etiological factors were not made out.

Age.—The youngest was three years of age, the oldest fifty-three; the others were about evenly distributed between these limits.

Sex.—Two were females, the other eight males.

Occupation.—One a clerk; 1 a stereotyper; 1 an iron worker; 1 a laborer; 1 a maid; 1 housewife; 4 no occupation.

Nationality.—Four were born of American, 2 of Italian, 1 of Scotch, 1 of German, 1 of Irish, 1 of English parents.

Symptoms, Signs, and Course.—In a general way all these patients may be said to have presented from the first abdominal, rather than thoracic symptoms, except Case IX., where the chest symptoms preceded the others.

In both appendicitis cases following the usual symptoms an abscess had developed about the appendix and this had been opened and drained. In each case the temperature and pulse did not regain the normal, and at a period of nine days in one case, and forty-six in the other, signs of a subphrenic collection were detected. In one case the purulent collection had traversed the diaphragm into the pleura and thence into the lung, breaking through into one of the bronchi. Relief and rapid healing followed the evacuation and thorough drainage in each case.

In both cholecystitis cases there was abdominal pain, especially over the gall-bladder region, fever, constipation, chills, slight jaundice, and prostration. In one case a mass was distinctly felt in the region of the gall-bladder ; in the other, muscular rigidity prevented satisfactory palpation. In each case the gall-bladder was opened and drained. One patient went on to the formation of a second subphrenic abscess which infected the pleura. Thorough drainage was without avail. The patient died in a septic condition. The other patient had a complicating condition, a pregnancy near term. A general septic peritonitis had started in before the operation. She died three days later.

Both patients with abscess of the liver had pain referred to the liver region, fever, and sweating. In one the bowels were constipated, in the other loose. One was jaundiced, the other not. In both a tumor could be made out. Evacuation and drainage of the cavity was followed in one case by rapid healing and recovery ; in the other the same thorough treatment was without avail. The patient died in a septic condition.

In the patient with the perinephritic abscess the stomach was first supposed to be the starting-point of the trouble, as there were no urinary symptoms whatever at the outset, and there was a history of several attacks of gastric disturbance without apparent cause. Pus was, however, found later in the urine in considerable quantities. A mass developed just under the costal border on the left side with

signs of an accumulation below the base of the left lung. Relief followed the evacuation of the abscess, which was just below the diaphragm. There was an accumulation, however, six months later (about one month ago), and the patient still has a small sinus at this writing. A tubercular element was considered highly probable from the start, although no tubercle bacilli were found in the various microscopical examinations.

In the patient whose subphrenic abscess followed an empyema, there had been a pneumonia eight years before. Five years later an empyema, probably tubercular, had been evacuated and the cavity drained. He had remained well for about three years. Then gradually, three months ago, signs of a tubercular inflammation in that lung with the formation of cavities were detected, followed by a fresh accumulation of fluid in the pleural space, with the usual symptoms. This was followed by extension to the subphrenium without any additional symptoms apparently, except some epigastric pain and tenderness. There appeared then, on the left side in the epigastrium, a dull, tender, fluctuating tumor. Evacuation of this abscess, which was situated directly under the diaphragm, was followed by free drainage. The patient did perfectly well. There is still a small sinus, which is closing rapidly at the present writing.

Of the two cases of doubtful origin, one was in a boy aged three, who simply told of epigastric pain for ten days, when a tumor appeared. He was slightly jaundiced. An abscess cavity was incised and drained in the epigastric region. Neither microscopical examination of excised portions of abscess wall, nor cultures from the pus, threw any light upon the origin of the inflammatory process. The inflammation spread to the right side, in spite of frequently repeated irrigation and packing of the wound; and a second abscess was opened on that side, between liver and diaphragm. He left cured.

The other patient began with pain in the lower abdomen, shifting to the left lumbar region, where an area of tenderness was detected. There were no other symptoms. A subphrenic abscess was evacuated and drained. The patient made an excellent recovery. The origin of the trouble could not be definitely ascertained.

Thus we see that in seven cases the presence of a tumor, or of a slight bulging, was made out before operation. In the other three cases, reliance was placed on physical signs alone for the diagnosis, which was confirmed by the findings at the time of operation.

In six cases there were signs indicating more or less associated inflammation in the lower part of the pleural cavity on the same side.

Of the cultures made from the pus of these abscesses, some were found to contain no growth whatever; some contained the staphylococcus pyogenes aureus et albus; some the bacillus coli communis, and some the bacillus fluorescens.

The microscopical findings of the pus and of the scrapings from the abscess walls cleared up the etiology in only one case, where liver-cells were found (abscess of liver). In one case they indicated the presence of an abscess of long standing.

Diagnosis.—The aspirating needle was resorted to in the cases where the diagnosis seemed in doubt. As a rule the needle was inserted laterally, according to the physical signs, somewhere between the ninth and twelfth ribs, and between the anterior and posterior axillary lines, or a trifle farther backward. If there was a bulging anteriorly, the needle was inserted into the most prominent part of this bulging, and if possible, at a point where adhesions had already formed to the anterior abdominal wall.

Operative Methods Adopted.—When the aspirating needle had found pus, the incision was usually deepened at this spot, with the needle as a guide, and portions of rib were resected when necessary; usually portions of one or two ribs were removed—ninth to eleventh—according to the amount of drainage indicated. Counter-openings farther down were also made when additional drainage through a more dependent portion of the cavity seemed advisable.

In all cases the finger was introduced, and the relations of the parts forming the abscess walls noted. [As previously stated, only those cases are included in this paper where the diaphragm was made out above, forming the roof of the cavity.] After evacuation of the abscess, the cavity was usually washed out thoroughly with hot sterile normal salt solution, then packed loosely with sterilized gauze, and drainage-tubes inserted where it seemed advisable. Cultures were usually made from the pus as it flowed out of the incision, and when possible a portion of the sac-wall, together with some of the abscess contents, were sent to the pathologist for microscopical examination.

After-treatment.—The local after-treatment in most cases consisted of such frequent irrigations of the abscess cavity with sterile salt solution as was indicated by the quantity and character of the

discharge. The drainage-tubes were gradually shortened as the cavity contracted, and rapid healing was favored by gentle stimulation after the inflammatory signs had subsided. General tonic and supporting treatment was carried out as indicated. In most of the cases, when we consider the size of the suppurating cavities, the healing process may be said to have gone on in them with great rapidity after their evacuation.

The patients were allowed to leave the Hospital either entirely healed or with a sinus of an inch or so in depth, requiring only a few subsequent dressings.

As far as known, only one case (VII.) had a recurrence.

Out of these ten cases operated upon, there were three deaths. Mortality, thirty per cent. They were briefly as follows :

Case II. Abscess of Liver.—Subphrenic abscess, empyema, complicating nephritis, sepsis. Death. From the microscopical findings the abscess had evidently been one of long standing.

Case VI. Cholecystitis.—Acute attack, with marked constitutional and local symptoms and inflammatory infiltration of the gall-bladder. Process extended up into subphrenium, thence apparently by the lymphatics through the diaphragm into the pleural cavity, which was found covered with a yellowish-green purulent deposit. Death from sepsis.

Case VIII. Cholecystitis.—Acute attack, with the formation of a large subphrenic abscess and with a general septic peritonitis, complicated by pregnancy near term, and by endocarditis. Patient died of her general septic peritonitis on fifth day.

NOTES ON THE INDIVIDUAL CASES.

Case I.—Subphrenic Abscess from Abscess of the Liver. Incision and Drainage. Recovery. Service of Dr. McCosh.

V. T., aged fifty-three ; married ; laborer ; Italy ; admitted February 16 ; discharged March 11, 1893. Perfectly well till two and a half months ago, then pain in right hypochondrium, fever, sweating. No diarrhœa. No vomiting. Symptoms have persisted. Patient has been unable to attend to his work. No urinary symptoms.

On Admission.—On the right side a mass extends from the free border of the ribs to the line of the umbilicus, but not to the op-

posite side. It is smooth, firm. There is dulness over it which is continuous with the liver dulness above. The area is tender. Distinct fluctuation is present.

Heart and lungs normal. The patient is very feeble and stupid; there is some icterus. Urine negative.

The liver was thought to be the focus of the abscess.

February 16, 1893.—An aspirating needle was introduced on the right side through the ninth intercostal space in the anterior axillary line, and a maroon-colored and turbid fluid withdrawn. A larger evacuating needle was introduced at the same spot and thirty-two ounces in all withdrawn. The tumor in the hypochondrium communicated with the abscess above the liver. It was seen to be markedly diminished in size following the withdrawal of the fluid from above.

Microscopical examination of this fluid showed fifty per cent. blood-cells and pus. Slight improvement followed the aspiration. The next day, under cocaine, an incision was made through the ninth intercostal space at the site of the previous puncture and sixty-four ounces of similar fluid withdrawn. A large drainage-tube was inserted into the cavity. The patient improved gradually, the wound discharging freely. February 27, 1893, the patient sat up and on March 11, left the hospital feeling well, with the wound almost healed.

Case II.—Abscess of Liver. Subphrenic Abscess. Empyema. Complicating Nephritis. Sepsis. Death. Service of Dr. McCosh.

R. S., aged forty-four; married; iron worker; Scotland; admitted to Surgical Division November 9, 1894; died November 21, 1894. Previous history entirely negative, except for influenza six years ago, from which he recovered perfectly. Three weeks ago was exposed to cold and wet; this was followed by colicky abdominal pain and diarrhœa, fever, sweating, shortness of breath, and pain in the right side. No blood in the stools and he was never jaundiced. Some swelling of the abdomen was noticed from the start.

On admission to Surgical Division the lungs were fairly clear in front; subcrepitant râles and feeble respiration in both axillary regions. Right chest behind, dulness to flatness and loss of vocal fremitus, distant bronchial breathing, occasionally a mucous click. Left chest behind, some dulness below the angle of the scapula with subcrepitant râles, and broncho-vesicular voice and breathing.

Abdomen.—In median line directly under the ensiform an elastic globular swelling, which does not seem to be connected with anything. It pulsates with the aorta on deep pressure and percusses dull. Friction sounds are heard over it at present. There is some flatness in the right flank. The abdomen does not seem specially tender to pressure.

The patient ran a temperature of 100–103½° F. (most of the time between 102–103° F.) and a pulse of 100 to 110 per minute for several days after his admission to the Medical Division.

On November 5, 1893, signs of fluid had appeared in his right chest and an exploratory needle had withdrawn blood-tinged fluid. Friction-sounds had also made their appearance over the mass in the epigastrium. His diarrhœa kept up.

On November 6, the right chest had been aspirated and twenty-three ounces of fluid withdrawn, the tumor in the abdomen had been explored by needle and two ounces of pus drawn out. His urine at this time contained three per cent. albumin and some hyaline casts. The patient was becoming distinctly septic.

On November 9, he was transferred to the Surgical Division, service of Dr. McCosh, and a vertical incision made just below the ensiform; the mass presented a little below that. The abscess was opened, and the pus evacuated. The pancreas seemed to be at the bottom of the cavity, the diaphragm was directly above; two drainage-tubes were introduced.

Microscopical examination of the pus showed granular detritus, pus cells, needle-shaped and burr-like crystals, very likely fat compounds.

Cultures from the pus showed "no growth in the tubes" (Thacher).

The patient improved somewhat following the operation, but his pulse and temperature remained high; pulse, 100–120; temperature, 102–104° F.; there were profuse sweating, diarrhœa, and delirium. The wound was irrigated daily and did well. November 15, the fluid which had reaccumulated in the right chest was aspirated to the amount of nineteen ounces, and again on November 18 to the amount of seventeen ounces. Microscopical examination of this showed pus, débris, many fat drops, many needle crystals, probably of fatty origin, several hæmin crystals; many things like shrivelled cell-capsules of unknown origin and nature . . . . are evidently

from abscess of long standing (Thacher). Examination of pus from abdominal abscess showed many cells like liver-cells.

November 20. Patient losing ground fast, his stools are brick-red with blood.

November 21. Two ounces of fluid removed by needle inserted just below the angle of the scapula, thick, purulent, chocolate colored. Needle inserted one inch above withdraws turbid fluid, but entirely of different character from preceding. Patient got progressively weaker, and died of sepsis, November 21, 1893.

Case III. Appendicitis Abscess; Evacuation and Drainage. Subphrenic Abscess, Evacuated and Drained Above; Appendix Stump Removed below. Recovery. Service of Dr. McCosh.

E. C., aged twenty-three; single; maid; admitted February 6, 1896. Discharged May 5, 1896. One previous attack of appendicitis (two years and a half ago). Present attack began one week ago with abdominal pain, cramps, vomiting for twenty-four hours; pain shifted to right iliac region; constipated; mass formed in right iliac fossa extending to crest of ilium.

February 6, 1896. Mass was opened and discharged a pint of very foul pus. Iodoform gauze drainage.

Following operation the patient did well, but her temperature stayed up between 100–101° F. most of the time, with a pulse above 90, and there was considerable and constant abdominal pain with occasional vomiting. The wound discharged freely and received daily dressings.

February 12. Her temperature began to rise and pain increased somewhat. From this time to March 22 patient had a temperature of 101–103° F., and pulse 98–100, with considerable abdominal pain on and off, but no signs could be detected of further trouble, the wound behaving well.

March 22. Temperature rose to 104° F., pulse to 108, and pain was complained of below the left scapula. An area of puffiness, the size of a silver dollar, developed just below the tip of the scapula on the right side.

March 24. Chloroform: the remains of the appendix stump were removed below; the patient was then turned on her left side and a needle introduced at the site of the puffiness between the ninth and tenth ribs, midway between the posterior axillary and mid-dorsal lines. Six ounces of foul greenish pus were evacuated.

The cavity was opened ; it extended downward from the diaphragm. A counter-opening was made below the twelfth rib in the same line and two drainage-tubes introduced. Pulse and temperature both fell to normal after this last operation and remained so (except for slight elevation on April 6, 7, and 8, due to formation of small stitch abscess). Patient did perfectly well and on May 5, 1896, was discharged with wound closed. (See article on "Appendicitis," Presbyterian Hospital Reports, 1897, page 138 ; page 143(d), and Case No. 34 of table.)

Case IV. Abscess in Epigastrium. Incision and Drainage. Formation of Subphrenic Abscess. Incision and Drainage. Recovery. Service of Dr. McCosh.

W. V., aged three ; born in United States ; admitted May 21, 1896 ; discharged July 17, 1896.

History negative until ten days ago, when he began to complain of pain in upper abdomen and his mother noticed slight swelling in epigastrium. Pain and swelling continued. No vomiting, bowels regular. Has lost much flesh.

On Admission.—Boy is somewhat jaundiced. There is a mass in the epigastric region of about the size of a hen's egg, dull, continuous with the liver dulness. Temperature 101.5° F., pulse 104.

May 23, 1896. Longitudinal incision over the abscess, pus was found extending deep down. The walls of cavity were scraped, as they appeared to be tubercular, and iodoform gauze introduced for packing.

Microscopical Report on the Scrapings.—Changes of simple inflammation (Thacher). After the operation the pulse and temperature fell to normal and remained so, the wound healing gradually from the bottom, until about June 5, when both temperature and pulse began to rise gradually, but no abnormal physical signs were detected until June 15, when the liver was made out to be pushed downward below the free border of the ribs on the right side and there was a distinct bulging in this situation. June 16, an incision was made just below the free border of the ribs, parallel to them, about two inches long. The muscles were found œdematous. An abscess-cavity was opened into which discharged several ounces of purulent fluid similar to that obtained in the first operation. The finger introduced into this cavity felt the diaphragm above and the

liver below and internally. Cultures were made and portions of the sac excised.

The cultures showed the presence of the staphylococcus pyogenes aureus.

The sections of the sac-wall showed: simple inflammation (Thacher).

The cavity was packed with iodoform gauze moistened in 1–1,000 bichloride solution. The temperature and pulse fell to normal directly after this operation and remained so. The wound healed rapidly under repeated irrigations followed by packing.

Cultures from the purulent secretion made on June 23 revealed the presence of the staphylococcus pyogenes aureus, et albus? (Thacher.)

On July 14, 1896, the sinus closed, and on July 17 the patient was allowed to leave the hospital, completely healed.

Case V.—Appendicitis Abscess. Incision and Drainage. Subphrenic Abscess. Empyema. Rupture into Bronchus. Drainage of right Subphrenic and left Pleural Spaces. Recovery. Service of Dr. McCosh.

E. V. N., aged twenty; single; United States; clerk. Admitted October 24, 1898, discharged December 18, 1898. Well until seven days ago, when patient had general abdominal pain; four days later it shifted to right iliac fossa. Some vomiting. Bowels loose.

On Admission.—Slight icterus. *Heart:* systolic and presystolic murmurs. *Lungs:* behind, over base of right lung expiration and voice slightly exaggerated. *Abdomen:* between the anterior superior spine of ilium and the ribs in the anterior axillary line there is a tender mass.

Diagnosis.—Appendix abscess.

October 28, chloroform incision and drainage of appendix abscess, which contained an ounce or more of foul-smelling pus. It was situated behind the colon. Drainage by gauze and rubber tubes. Following the operations, daily irrigation and dressings were done and the wound behaved well. The appendix slough came away in the wound discharge with a fecal concretion. On October 30 the temperature, however, kept up between 100–103° F. most of the time, with a pulse of 70–80, without any ascertainable cause and without any further physical signs. Widal test gave a negative re-

sult. On November 6, 1898, the temperature rose to 105° F., pulse to 120, and respiration to 40–48 a minute, and patient had a severe attack of coughing, expectorating a large quantity of foul, greenish-yellow pus. Gastric lavage returned clear. The expectorated pus had the odor so common to pus from an appendix abscess; a probable diagnosis of subphrenic abscess was made and a needle introduced in the tenth intercostal space in the post-axillary line withdrew pus. Incision was then made along the tenth rib at this spot, and an inch and a half of the rib resected. An abscess was opened into situated directly under the diaphragm, and having an opening above into the pleural space. One inch and a half of the ninth rib above was also resected for better drainage, and the pleural abscess evacuated. The latter was large and contained much foul pus. Iodoform gauze and drainage-tubes were inserted into both abscess cavities. After this operation the temperature and pulse gradually subsided, and patient made an excellent recovery. December 7 he sat up, and on December 18 he was discharged from the hospital with both wounds healed.

Case VI.—Acute Cholecystitis. Cholecystotomy. Subphrenic Abscess. Empyema. Drainage of right Subphrenic and right Pleural Spaces. Sepsis. Death. Service of Dr. McCosh.

Ch. R., aged forty; single; Germany. Admitted October 17, 1898. Died November 20, 1898. Always well until eight days ago. General abdominal pain and headache. Pain shifted to right side of abdomen three days later. Fever, chills, constipation. No vomiting. Never before jaundiced.

On Admission.—Slight jaundice. *Heart* and *lungs* normal. Slight general abdominal tenderness; marked rigidity from right costal margin to a little below level of umbilicus. Liver percusses large, to two inches below free margin of ribs on right side. No mass made out. Complains of pain mostly over gall-bladder. This pain increased and patient's temperature was 101–103° F.; pulse, 70–80; respiration, 20–30.

October 25, under chloroform, an incision through right rectus muscle, at its outer border, opened into an encapsulated pus cavity, containing about two drachms. The gall-bladder seemed enlarged; the gall-duct, common duct, and the head of the pancreas were examined by the finger. The pancreas seemed rather hard, but no stone was felt. While palpating the gall-duct a mass, probably a

collection of inspissated mucus, was felt to slide downward and out of reach. The liver was not specially enlarged, nor did there seem to be any evidence of liver abscess. The gall-bladder was stitched securely to the abdominal wound and opened. It contained bile only. Its walls were infiltrated and very œdematous. (Cultures taken from its contents revealed the presence of bacillus coli communis.) It was drained with sterilized gauze. Following the operation the patient did fairly well for the first three days. Bile was discharged freely through the wound. Cough then started in, the temperature remaining 101–102° F.; pulse, 70–84. Bile appeared in the urine on October 31. On November 4 pain began in the right chest, and there was some dull red sputum. Physical signs of an empyema gradually appeared. On November 10 an aspirating-needle was introduced in the tenth and in the ninth intercostal spaces, but nothing was withdrawn. An incision was made over the tenth rib, and a portion of the ninth and tenth ribs resected; above a quantity of reddish-brown pus was evacuated from the pleural cavity, the visceral pleura being covered with a greenish-yellow deposit. Below an abscess was found situated between the diaphragm and liver. Both abscesses were drained. The results of the cultures from these abscesses were without value, unfortunately, owing to contamination of the tubes. Following this second operation, in spite of frequent irrigations of the abscess cavities and supporting treatment, the patient gradually succumbed to his septic condition and died November 20.

Case VII.—Subphrenic Abscess of Perinephritic Origin. Incision and Drainage. Six months later Re-formation of Abscess. Evacuation through old Scar. Recovery. Service of Dr. McCosh.

H. P., aged thirty-seven; single; United States; stereotyper. Admitted, May 16, 1899; discharged, June 30, 1899; readmitted November 13, and discharged November 30, 1899. Family history negative. Patient has a moderate alcoholic habit. Fifteen years ago an alveolar abscess from dental caries formed, was opened and healed. Six years ago, for two weeks he had an attack of vomiting, with pain in the epigastrium. The vomitus consisted of food and mucus. There was apparently no cause for the attack. Six months ago a similar attack came on which lasted three weeks. Since then perfectly well until twelve days ago, when the gastric symptoms returned. He is usually constipated. For some months

he has noticed that his urine was cloudy, especially the last portions voided. Otherwise no urinary symptoms.

On Admission.—Patient anæmic. Lungs negative. Liver percusses normal. Five days later an area of flatness was made out about four inches in diameter at the base of the left lung posteriorly where there was an absence of breathing-sounds ; another similar area was found somewhat higher up. Also gradually there developed a small rounded mass, projecting about two inches below the left costal margin in the mammary line ; considerable tenderness in left epigastrium. During these days his urine showed increasing quantities of albumin and pus-cells.

May 23, twenty-five per cent. albumin by bulk and large number of pus-cells. The condition was thought to be a subphrenic abscess, and the diagnosis lay between stomach and kidney as the focus. A needle was introduced between the eleventh and twelfth ribs in the axillary line and withdrew pus ; an incision was made here along the eleventh rib and a part of it excised. In going into the abscess the pleural cavity was accidentally opened. The opening was immediately packed with gauze. A lower incision was then made below the diaphragm, opening into a large pus-cavity which felt perinephritic. Much purulent fluid was evacuated ; two rubber tubes and some gauze as drain were left in. The pus almost immediately cleared up in the urine, and by June 27 the urine was normal. The wound healed nicely and the patient left the hospital June 30, with a one-inch sinus. He was well then until October 21, when he had an attack of pain in the left lumbar region, with fever, chills, and purulent urine. This lasted only a week. He remained well then for about one month, when he began to have a return of the trouble (eight days ago) ; severe pain in the lumbar region with chills and vomiting. Two days ago, a swelling appeared in the region of the old scar. His urine then contained a trace of albumin, and a little pus. After evacuation of this abscess (which was done through the old scar) it contained, in addition, blood and some hyaline casts. Repeated examination of the urine and of the pus from the abscess failed to discover the presence of any tubercle bacilli. The cultures from the pus showed the presence of very active motile bacilli, probably a variety of bacillus fluorescens (Thacher). After this last operation the patient did perfectly well, leaving the hospital November 30, 1899, with a small sinus.

Case VIII.—Cholecystitis (acute Attack) with Subphrenic Abscess and General Septic Peritonitis, Complicated by Pregnancy near Term and by Endocarditis. Evacuation and Drainage. Expulsion of Fœtus. Sepsis. Death. Service of Dr. F. Tilden Brown.

M. R., aged thirty ; married ; Italy ; housewife. Admitted July 20, 1899; died, July 25, 1899. Mother had a tumor; patient has had three children, latest three years ago. Has not menstruated for seventeen months. Three weeks ago, was taken with fever and constipation, one chill a few days ago ; ten days ago a lump appeared in the epigastrium, tender, not painful. No vomiting. Never jaundiced. Stools never clay-colored. Urine dark. No headache. Appetite poor.

On Admission.—Anæmic, weak, looks septic ; slight icterus to conjunctivæ and skin. Tongue moist, coated with whitish fur.

Heart.—Tumultuous. Systolic murmurs base and apex. Apex of heart, fifth interspace, nipple line.

Lungs.—Percussion is high pitched anteriorly and respiratory murmur poor over all. Râles posteriorly over both lungs. Breathing harsh on left side ; on right side it is diminished as low as the eighth rib behind. Below this it is absent.

Abdomen. — Caput medusæ very prominent; umbilicus protrudes ; entire abdomen is irregularly prominent. In epigastrium is a uniform swelling four inches in diameter ; painful, fluctuating. The flatness over the tumor merges into the liver dulness. Below is the uterus with contained fœtus. In the right lumbar and hypochondriac region there seems to be another tumor very hard, not painful. Free fluid in abdominal cavity. Œdema of ankles. By vagina fœtal head was plainly felt.

July 22, needle introduced into the tumor withdrew turbid fluid ; the mass was found under the diaphragm and adherent to the anterior abdominal wall ; it was evacuated. A pint and a quarter of turbid fluid escaped. Incision was made in the right lumbar region, and one pint of serous fluid escaped from the peritoneal cavity. A cystic mass was then felt communicating with the mass previously obtained. The first opening made into the abscess was therefore enlarged, and on exploration about one quart of thick pus escaped. Iodoform gauze was introduced as a drain.

The patient did not rally from the operation, the septic condition increasing. The uterus emptied itself that evening of a fœtus which

lived a few minutes only. The bowels remained obstinately constipated, and the mother died on the third day after operation. The blood count just before the operation, gave leucocytes 30,000.

Case IX.—Subphrenic Abscess following old Empyema. Incision and Drainage. Recovery. Service of Dr. McCosh.

C. E., aged thirty; single; clerk; United States. Admitted, September 25, 1899; discharged, October 25, 1899. Perfectly well until eight years ago, when he had an attack of pneumonia. Following this he had cough, night-sweats, and hæmoptyses. Three years ago he was operated upon for empyema. The wound healed nicely and he gained flesh and strength, the symptoms gradually disappearing. Three months ago pain in the left side of his chest returned with cough, dyspnœa, afternoon fever and slight chills.

On Admission.—The patient is in fair condition.

Heart.—Negative.

Lungs.—Right; negative. Left; flat to dull base to apex in front and behind. There are the physical signs of numerous cavities anteriorly, and posteriorly old scar of rib resection on the left side. There is a distinct tumor in the left epigastric region, fluctuating, flat on percussion, tender; aspirating needle introduced into the tumor withdraws pus. Another needle introduced into pleural cavity above withdraws bloody serum.

September 26, 1899, under chloroform exploratory needle was inserted in anterior axillary line between tenth and eleventh ribs on left side. Pus withdrawn. Incision was made here and a portion of eleventh rib resected. One quart of pus evacuated. The cavity was situated just below the diaphragm. Gauze drainage with two rubber tubes. Patient did perfectly well after the operation and left the hospital one month later, the wound being almost healed.

Case X.—Subphrenic Abscess. Incision and Drainage. Recovery. Service of Dr. McCosh.

G. N., aged thirty; married; Englishman. Admitted September 28, 1899; discharged November 4, 1899. Always perfectly well until eleven years ago, when he had an attack of cholera morbus. He recovered from this perfectly. This spring he was continually exposed to wet weather in Texas. Three weeks ago there was a gradual onset of pain in the lower abdomen on the left side. The pain became severe but was not enough to double him up. Later, it moved to the small of his back, where it has since remained. The

pain is inconstant, has no connection with defecation or urination, which are both normal. There is no pain elsewhere. There has never been any jaundice. Four days ago he went to bed by the advice of his physician. He does not know whether he has had any fever or not.

On Admission.—His physical examination was entirely negative. His urine contained a slight trace of albumin ; later, a few casts were found. He went along with a temperature of about 102° F. ; pulse, 100 ; respiration, 24. His blood showing no malarial organisms and giving no reaction to the Widal test until October 5, when a few pleuritic râles were detected over the left chest. Two days later an area of tenderness was found midway between the crest of the ilium and the twelfth rib, and his pain kept on increasing. His blood showed 29,000 to 30,000 leucocytes. He sweated profusely. The area of tenderness gradually spread. He was transferred to the surgical division.

October 13, 1899. Under chloroform a needle was inserted just below the margin of the ribs on the left side, back of posterior axillary line, and pus withdrawn. Incision was made along the needle into the cavity. Finger introduced detected a cavity extending deeply downward and upward to the diaphragm, containing many loculi. Several ounces of thick pus were evacuated. It did not communicate with the general peritoneal cavity. The cavity was irrigated and drained with gauze and drainage-tubes. The wound did well and the patient left the hospital November 4, with the wound closed. The microscopical examination of the abscess contents showed blood and pus-cells and a few fibres of voluntary muscle. No bony tissue found. No tubercle bacilli found (Thacher).

XIII.

REPORT OF A CASE OF SCLERODERMA OF THE UPPER EXTREMITY.

By A. F. Büchler, M.D.

In the classification of scleroderma usually two forms are considered, the circumscribed, characterized by a distinct border of demarcation, and generally, by comparatively superficial infiltration, and the diffuse, with marked induration of the skin and subcutaneous tissue and adhesion to the subjacent structures. Occasionally, however, we meet with examples of scleroderma, in which some of the manifestations inherent to each type of the disease are encountered, thus obliterating the sharp lines of separation, and supporting, from a clinical standpoint, the views entertained by pathologists of the identity of these two forms.

Such were the conditions in the case under consideration, seemingly justifying its depiction with a brief narration of the history.

The subject of this sketch is a well-nourished, exceedingly bright and vivacious girl, aged ten, first coming under observation at the Class for Skin Diseases of the Dispensary on October 9, 1899.

Her family as well as personal history are entirely negative.

About two years ago, and about one month after she had received a slight scald, there appeared on the radial border of the right forearm, according to her mother's statement, an erythematous patch which looked like a sunburn; the exact shape and dimensions of this could not be ascertained. It gradually increased in size, and advanced up the forearm in a linear direction as far as the elbow.

This was not attended by any annoyance whatsoever, nor was it preceded by chills, fever, rheumatic or neuralgic pains in this or other parts of the body. There is no history of antecedent œdema.

The erythema remained stationary for about two months, when a change in color was observed. The redness gradually faded, and the skin assumed a yellowish-white appearance; at the same time it felt distinctly harder to the touch.

Within the first year after its onset, the disease was entirely confined to the forearm, but in the following year it advanced up the arm and shoulder. Whether or not in its progression it was always preceded by an erythematous stage could not be ascertained. On the girl's first visit to the dispensary the following condition was noted:

The affection, for which the patient presents herself, begins at the posterior border of the scapula, invades the scapular region to about the extent of a hand's breadth, involving mainly the supraspinous, and in a lesser degree the infraspinous fossa; passes along the posterior aspect of the shoulder to the extensor surface of the arm, where it assumes a band-like appearance; then descends along the latter as well as the posterior radial side of the forearm, and terminates within an inch from the styloid process of the radius. Its distribution is zosteriform along the tracts of the branches of the posterior cord of the brachial plexus—the circumflex and musculospiral nerves and the radial branch of the latter.

Throughout its entire extent, excepting at its posterior scapular limits, the area involved in the process is distinctly circumscribed by a bluish-red border, which is especially well marked after the extremity has been exposed to the air for some time.

Within this areola the integument presents a variable degree of induration, some atrophy and discoloration.

The forearm is the part in which the indurative process is most pronounced, the sclerosis extending deeply into the subcutaneous tissue. The thickened skin is distinctly elevated above the normal integument, and is in part firmly adherent to the radius, in part can only be raised in the broadest of folds.

Its surface is smooth, glistening, and polished, excepting at a point about one-half inch from the lower confines of the pathological process, where an atrophic depression with some roughness is noted.

It is generally of yellowish waxy appearance, with interlacing here and there of erythematous and leucodermatous spots.

In the arm, the induration, though distinctly palpable, is less advanced than in the forearm; here there is no attachment to the underlying bone. The skin and subcutaneous tissue are bound together, but they can more readily be pinched in folds than in the forearm. The surface is wrinkled and roughened by desquamation of epithelium. Approaching the deltoid region, there are here found

four leucodermatous patches in a pigmented skin of yellowish-brown color, but of normal thickness.

Over the scapula there is present, in a field of slightly atrophic skin, an irregular horse-shoe shaped plaque of induration. This is of waxy appearance, and has a yellowish-brown pigmentary border which, in its lower part, becomes diffused in the surrounding lilac-field.

The posterior scapular confines are indicated by a leucodermatous and lilac network, the skin here being neither raised nor depressed. Apart from the main seat of the affection, there is seen on the inner surface of the arm, at a distance of about two and one-half inches above the internal condyle, an irregularly pyramidal-shaped lesion. It is of chalk-like whiteness, and imparts to the touch the sensation of infiltration rather than of induration. It lacks the border of demarcation. (This it was not possible to reproduce in the plate.) The tactile and thermic sensibilities of the extremity are perfectly normal; there is no derangement of sensation whatever, with the exception of a point of hyperalgia in the atrophic depression of the forearm. The perspiration is not suppressed in the parts involved. The nails show no trophic changes. There is no evidence of dys- or athyreosis. The urine contains neither albumin nor sugar.

From the above symptomatology, it will be seen that the affection does not strictly conform to either type of scleroderma, but partakes of the characteristics of both—the sharp line of demarcation of the circumscribed, and the intense induration of the diffuse form. The treatment instituted, and carried out during the last two months, was the daily massage of the involved parts.

This has been attended by a decided involution of the induration, the entire effacement of the hyperæmic border in the forearm, and, in a measure, also in the scapular region. The erythematous spots have likewise disappeared.

Concerning the pathogenesis, the distribution of the lesions along the nerve-tracts apparently points to a neurogenic origin. This view of the nature of scleroderma claims more adherents than any other that has been advanced, yet it rests upon a rather unstable anatomical basis, since the pathological changes in the nerve-centres and in the peripheral nerves are most varying and contradictory.

On the other hand, careful researches, notably those of Dinkler,

Wolters, Lewin, and Heller, show profound alterations in the blood-vessels, as evidenced by periarteritis, endarteritis, sclerosis, and terminal obliteration of the arteries and dilatation of the veins of the corium and hypoderm.

Both Dinkler and Wolters locate the pathological changes of scleroderma primarily in the blood-vessels, regarding the hyperplasia of the connective tissue as a consecutive phenomenon. Indeed, in the case here reported, some of its manifestations, such as the hyperæmic border, the erythematous spots, and the pigmentation. can readily be explained in this way; nor does the apparent distribution of the lesions along the nerve-tracts militate against the acceptation of a vasar origin, since Pfeiffer and Manchot have recently demonstrated that the cutaneous nerves and vessels follow the same paths.

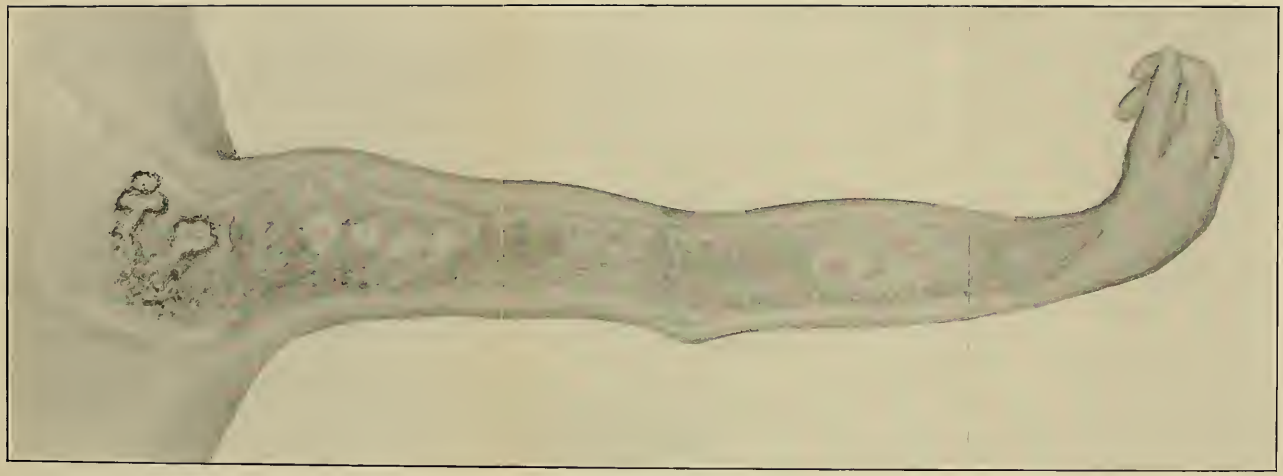


Fig. 4.

XIV.

EMPYEMA.

By John A. Hartwell, M.D.,
late house-surgeon.

The accompanying table is formulated from the histories of seventy-six cases of empyema, all that are found in the hospital records from July, 1889, to January, 1899.*

The work of putting the facts here recorded in a suitable form for reference was undertaken with the hope that some light might be thrown on the peculiarities of this disease, whereby it is rendered one of high mortality on the one hand, and of slow, tedious recovery on the other.

Quoting from "Surgery of the Chest," by Paget: "Our estimate of the mortality of empyema must vary according as we include or exclude the numerous troubles that are more or less a part of it. Bouveret, in 1888, collected 175 cases, with 55 deaths. Hofmohl (1889), of his 60 cases lost 28; but of these no less than 13 died of tubercular disease, 6 of pneumonia, 3 of pericarditis, 3 of peritonitis, and 1 each of amyloid disease, heart failure, and malignant disease. Konig, in 1891, published his 76 cases with only 10 deaths," etc., and concludes: "It is the complications of the disease that drive its death-rate up still to fifteen or twenty per cent.; were it not for these one might reckon it at ten or twelve per cent."

A condition presenting such a mortality as this and occurring with the frequency of empyema may well be looked upon with dread; and almost a worse feature is the protracted course of the cases not immediately proving fatal and the greater or less enfeebled condition in which the lung is left. In the table only such facts are included as may in some way, directly or indirectly, prove a point toward making empyema less fatal and less intractable. No recital of the individual cases is given, for the reason that all essential feat-

* One case of pulsating empyema occurring in Dr. McCosh's service was reported by him in 1896 and is not included here.

ures are incorporated in the table, and such recital needlessly consumes space and lacks interest.

I wish to acknowledge my indebtedness to Drs. Briddon and McCosh for the privilege of making this report on cases occurring in their services, and to Dr. Thacher for permission to utilize the bacteriological examinations made under his direction.

From this table the following conclusions are drawn as respects the bearing of each heading on the general characters of the disease:

Sex.—Among the 76 cases are found 56 males and 20 females. This same proportion holds in the relation of the sexes to pneumonia and pleurisy, the two conditions most often giving rise to empyema. An explanation of this preponderance of males might be supposed to exist in the greater exposure to wet and cold that they endure, but the proportion of two to one exists in children under five years of age, and here this factor does not enter. We are thus led to conclude from this small number of cases that males are more susceptible to pleural infection than females, and are unable to offer any explanation for this fact.

Age.—This factor presents most interesting material for consideration and practical deductions. First, it is a prominent element in the etiology of empyema. Second, it exerts a decided influence on the termination of the disease. The cases were distributed as follows as regards the age of the patients :

	Cases.	Per cent.
Under 5 years of age	14, or about	18.4
Between 5 years and 10 years	11, " "	14.5
Between 10 years and 20 years	12, " "	15.8
Between 20 years and 30 years	16, " "	21.0
Between 30 years and 40 years	11, " "	14.5
Between 40 years and 50 years	7, " "	9.2
Between 50 years and 60 years	4, " "	5.2
Above 60 years	1, " "	1.3

That is, nearly as great a percentage of cases exists in the first half decade as in any decade after the first. In the first decade the per cent. is nearly thirty-three, as against twenty-one in the third and 15.8 in the second. After the third decade the per cent. steadily decreases, until above the sixtieth year we find only one and a fraction per cent. Can any satisfactory reason be ascribed for such a distribution ? Pneumonia and pleurisy, as will be seen later,

head the list of conditions preceding the empyema by a large margin, and these affections are essentially disease of young adult life, though children and the aged are by no means exempt from them. This explains the prevalence of empyema between the fifteenth and the thirtieth year. Its comparative rarity in advanced life is probably due to the fact seen in so many diseases, that a resistance to infection above par is requisite to attaining old age, and that pneumonia *per se* is an especially fatal disease at this period of life, so that death occurs in the non-resisting before the pleural infection has time to be established.

The very frequent occurrence of empyema following a lung lesion in infants can only be explained on the rather unsatisfactory ground that resistance at this age is not very great to this particular form of infection. Such is by no means the fact as to all forms of infection, and accordingly we can offer no real answer to this division of our inquiry. The fact, though, of such frequent occurrence, cannot be denied, and its practical bearing is apparent.

Preceding Condition.—The consideration of this heading is of special interest now that it is known that an empyema can only result from the entrance of pyogenic organisms into the pleural cavity. Bearing this in mind, it is not surprising to find the majority of cases following an infection in the organ most closely related to the pleura. Of the 76 cases, the histories record 7 where the preceding condition could not be satisfactorily determined. The remaining 69 cases give the following figures:

A pneumonia positively preceded the appearance of pus in the pleural cavity 38 times, and probably on three other occasions; a serous pleurisy was so related 14 times, and 3 additional cases were also questionable; tuberculosis anteceded the empyema in 7 cases; sarcoma of the chest-wall in one; trauma of the chest-wall in 1; subdiaphragmatic abscess in 1; and pyosalpinx in 1. In 3 cases following pneumonia a serous effusion was diagnosticated by means of exploratory needles before the appearance of pus. That this sequence did not occur in many more cases, it is of course impossible to say, because the serous stage might readily have been overlooked and no exploration made until the purulent stage.

Thus, in 69 cases positively reported on, 38 cases, or fifty-five per cent., followed pneumonia; 14 cases, or twenty per cent., followed serous pleurisy; and 7 cases, or ten per cent., followed tuber-

culosis; the remaining fifteen per cent. arising from causes as given above. From the fact that phthisical patients are only rarely admitted to the hospital if the lesion be at all advanced the per cent. arising from such lesion is misleading. Among the cases reported as arising from serous pleurisy only a very small part were positively proved to have a serous effusion before having a purulent one, and it may be well claimed that in some of these cases the inflammation was due to a pyogenic infection from the start. This seems more than probable in Cases 20 and 43, where the sickness only began a week prior to removing a large quantity of pus from the pleural cavity. Among the 7 cases, also, where the antecedent condition was undetermined, it is probable that a part were primary empyemata, and our knowledge of infectious inflammation affords no reason why germs might not be carried to the pleural cavity through the blood or lymph.

The case (No. 12) in which the empyema followed a non-puncturing traumatism to the chest was undoubtedly of this nature, the abscess there being a manifestation of a pyæmic condition. And in Case 34, where the source of infection was apparently from a pyosalpinx, there was no pulmonic lesion antedating the pleural infection.

Side Involved.—The right pleura was involved 44 times, the left 28 times, both pleuræ twice, and in two cases the side is not recorded. Of the 44 right-sided cases 22 were of pneumonic origin, and of the 28 left-sided 14 were of pneumonic origin, showing about an equal chance of an empyema following a pneumonia irrespective of which lung may be involved.

Extent of Pleura Involved.—In nine cases the abscess-cavity did not extend throughout the entire pleural cavity, but was sacculated; in one it was a double sacculated condition, and in one it was general on the right and sacculated on the left.

The first of the two last named (Case 34) recovered after aspiration alone, one or both of the abscesses breaking into the lung, through which good drainage took place; the second (Case 21) died, the patient having been neglected before operation was resorted to.

Bacteria Present.—A bacteriological examination of the pus was made and reported in 41 of 76 cases, with the following results: The pus was without bacteria in 12 cases, as shown by the microscope; and in 7 of these it proved sterile on culture media, this

point not being reported in the other 5. The pneumococcus was found unassociated with other germs in 7 cases, the streptococcus in 5, the staphylococcus in 1, the micrococcus lanceolatus in 3, the diplococcus lanceolatus in 1, an indeterminate coccus in 1, the tubercle bacillus in 1, the bacillus coli communis in 1, and the bacillus pyocyaneus in 1; in 2 cases the pneumococcus was associated with the streptococcus, in 1 with the micrococcus lanceolatus, in 1 with a diplobacillus, in 1 with "other cocci," and in 1 with the streptococcus and the tubercle bacillus; in 2 cases the streptococcus and staphylococcus were associated.

Our general knowledge of purulent inflammations makes it impossible that pus should occur in the pleural cavity without some germ life having been at one time or another present there; and yet, at the time of examination, in 12 cases here reported, no bacterium was found, and in 7 cases the pus proved sterile on culture media. These examinations were made too at the time of the operation in nearly every case, when the pus was producing on the patient symptoms of septic poisoning. It is difficult to explain this condition, and a study of the cases adds to this difficulty, when it shows that the outcome here was in general no better than in cases showing an active germ-life. The question as to how the germ gains entrance to the pleural cavity has excited some discussion among writers, and the general suggestion, that it goes in through the blood or lymph, has been offered in answer; also that in specific cases it is carried in by traumatism, or by an exploring needle. The frequency with which empyema follows a pneumonia, and the frequent finding of the pneumococcus in the pus, makes it probable that in these cases the infection passes directly from the diseased lung into the pleural cavity through an inflamed area of pulmonic tissue. And the streptococcus or staphylococcus may also find entrance in this way in these cases, when these germs are associated with the pneumonic infection. But this leaves still unaccounted for many cases where no previous pulmonary lesion existed, and even those cases where a simple serous pleurisy preceded the formation of pus.*

The following figures throw what light is possible on this problem, so far as the cases here reported are concerned. In the 13

* Bovaird, in the *Medical News* for December 23, 1899, reports 28 cases, among a total of 82 autopsies on infants dying of empyema, in which no previous lung lesion existed, thus showing the possibility of a primary empyema, as here suggested.

cases where the pneumococcus was present, either alone or in association, a recognized pneumonia preceded the empyema in 10 cases, was doubtful in 2, and was reported absent in 1; in the 38 cases where a pneumonia preceded the empyema, a bacteriological examination was made in 24; deducting the 13 cases due to pneumococcus, there remain 11 cases in which empyema followed pneumonia, the pleural infection showing some other germ than the pneumococcus. These 11 cases were made up as follows: 1 contained the bacillus pyocyaneus, 3 the micrococcus lanceolatus, 1 a mixed staphylococcus and streptococcus infection, 1 an undetermined coccus, and 5 showed no germ life. From this it is inferred that in the condition of lowered resistance, due to pneumonia, any pyogenic germ near at hand may produce empyema. The streptococcus was found alone and in association 9 times, and in these cases a pneumonia preceded the empyema 5 times, a pleurisy 3 times, and sarcoma of the chest-wall once; the staphylococcus was found once only unassociated, and this in a case of trauma of the chest-wall. The bacillus coli communis was present in a case where the infection extended upward from a subdiaphragmatic abscess. The above cases all give some hint as to how and why the infection should have entered the pleural cavity. But we have left 8 cases in which no preceding lesion was made out, and 14 more in which a serous pleurisy became infected by pyogenic bacteria through some undetermined channel, and it is in these that we must look to the blood and lymph as the infection carrier.

The practical aspect of the bacteriology of empyema is most interesting, and we may hope at some time to be able to avail ourselves of this diagnostic aid to help in formulating proper treatment and in giving prognoses. The clinical course of this disease is, however, dependent on so many factors that it is difficult to correctly ascribe to each influence its just weight in producing the mild or severe nature of any given case, and so deductions must be cautiously made. The infrequency of the presence of any other germ than the pneumococcus, the streptococcus, the micrococcus lanceolatus, and the staphylococcus make it impossible to estimate its influence on the severity of the infection, and so we shall confine this consideration to the four named.

As stated, the pneumococcus was present in 13 cases, and of these four died; in the pus of two of these no other germ was pres-

ent, in the pus of one other cocci were found, and in the fourth streptococci and tubercle bacilli were found. In the 9 cases having pneumococcus and recovering, the disease seems to have run a severe and protracted course both where this was the only germ present and when there was mixed infection. This statement is in direct opposition to that made by some observers, but for this series it is indisputable. Whitney, writing in the "Twentieth Century Practice of Medicine," sums up a review of the literature on the bacteriology of empyema by saying, "These statistics, though few, illustrate a point upon which there is universal agreement—the course of pneumococcus empyema is essentially mild and benignant."

When considering later the factors which go to produce a fatal result more will be said on the influence of pneumonia, and the point further emphasized, that in the cases here studied a conclusion the opposite to that quoted must be reached.

The streptococcus occurring eight times, has a death record of two cases, but in neither does it seem to have been the real cause of the fatal termination, once sarcoma and once a tuberculosis being the cause of death. The remaining six cases are too varied in their characteristics to be of any value in giving conclusions. The staphylococcus was found three times, once alone in a fatal case where trauma of the chest-wall was the entering point of the infection from which a general pyæmia developed, and twice associated with the streptococcus, in which cases the recovery was slow but uncomplicated. The micrococcus lanceolatus was present in three cases, all following pneumonia and all terminating favorably, though one in which the pneumococcus was also present continued to discharge for four months. The influence of the tubercle bacillus has purposely been omitted from discussion because, as already stated, phthisical patients are not, as a rule, admitted to the hospital. However, a tubercular origin of the empyema occurred six or seven times, and in these cases the bacillus was found only once in the pus. The influence of this infection seemed to be to protract convalescence when not proving fatal, this latter termination taking place in four cases.

The Character of the Pus.—Under this heading are given, so far as reported, the physical properties of the pus evacuated, and practically no importance can as yet be attached to these characteristics. They give us no information as to what the course of the case will

prove to be, nor do they throw any light on the cause of infection. More extensive comparative observations of the pus and the bacteriology may be of assistance or scientific interest, but so far as the cases here reported are concerned no such claim can be made.

The Quantity of the Pus.—This possesses the interest of fact, but gives us no knowledge of importance. A cavity holding a few ounces of pus may be as intractable to healing as one holding pints, and perhaps more so, other factors being the real ones to consider. The formation of such enormous quantities of pus—125 ounces in Case 33—in the course of three or four days is interesting from a pathological stand-point, but need not be commented upon at this time.

Duration Prior to Operation.—The figures given under this heading are estimated from the clinical history of the case, as in few instances only is it possible to determine the exact date at which the formation of pus began. In those cases where a pneumonia preceded the empyema, this estimate probably approaches very closely to the actual time, for the course of this disease is so regular as to give fairly positive evidence of the development of a purulent process. On the other hand, where a serous pleurisy becomes purulent there may not be a sufficient change in the clinical picture to attract attention unless the case be under very careful observation. These estimates give the time as varying from two days to six months, and the distribution between these limits is so irregular that no value attaches to the average time. The only advantage to be gained from a study of these periods is to determine how much of an influence delay in operating has on the ultimate outcome of the disease. It is apparent that such delay acts unfavorably and may even result in a fatal termination where more prompt action might have effected a cure. This seems to be particularly true among children, and forces on the surgeon the necessity of making an early diagnosis in such cases.

The tabular headings so far discussed have all had a bearing on the clinical aspect of the disease irrespective of any treatment, so far as the latter could be disregarded. There remains for consideration the practical question as to the best means of treating empyema. In speaking of the bacteriology of the subject it was said that in the future a better knowledge of this branch of it might greatly modify treatment and prognosis in any given case, but that at present a

pneumococcal infection must be regarded in the same light as a streptococcal or a staphylococcal. The age of the case in hand, however, may be an important consideration in the formulating of treatment, as may also the condition of the patient, and, within certain limits, the duration of the infection before coming under observation.

General surgical principles prescribe the treatment of any collection of purulent fluid, namely, to allow exit for the pus and establish drainage of the abscess cavity so that pus thereafter forming may be promptly discharged. Empyema, a collection of purulent fluid within the pleural cavity, makes no exception to this prescribed treatment, and the only point to be determined is that of the means best suited to carry out this principle. But there are many difficulties in the way of such a determination from the study of a series of cases, for so many factors must be considered that great caution is requisite in giving to each its proper influence. However, a repeated analysis of all these factors and their mutual bearing must lead to something near the correct result, and the conclusions hereafter stated are reached by this means.

Formerly, it was deemed by many surgeons a sufficient fulfilment of the principles of surgery involved to aspirate the pus from an empyematous chest and possibly wash out the cavity through the aspirating needle with some mild solution, and this procedure seems even to-day to have some advocates. At a later period the recognized treatment was to make an incised opening through an intercostal space, evacuate the pus by this route and to insert some device for future drainage. Still later, the surgeon became bolder and to the incision added the removal of a portion of rib in order to permit of the freer drainage of the cavity. And at the present time the controversy as to how far each of these methods is applicable in the treatment of empyema is by no means settled, and, further, the surgeon has to elect the place of opening, whether by simple incision or by rib resection, and must decide the extent of tissue to be incised or removed. Another point of continual discussion relates to the irrigation of the abscess cavity both at the time of operation and during the after-treatment. Another relates to the irrigating fluid to be used, provided any irrigation is deemed advisable. Then the question of the use of an anæsthetic requires answering, and what anæsthetic shall be used. And finally the means by which drainage shall be maintained as long as may be necessary.

Aspiration.—Among the cases here reported there are found three in which simple aspiration of the chest-cavity was used without any further surgical proceedings. The first case, No. 34, was a double sacculated empyema, where the source of infection seems to have been a pyosalpinx, no pulmonic lesion having existed. Seven and a half ounces of flaky pus were withdrawn from the right chest, and four weeks later five and a half ounces from the left. A few days after this aspiration, the patient began to expectorate from three to seven ounces of pus daily. From this she progressed to a gradual but complete recovery in the course of ten weeks. There has been no recurrence of the trouble up to the present time, three years later. Evidently in this case the aspiration was supplemented by the rupture of the cavities into a bronchus, through which drainage took place. No pneumothorax resulted, probably because the area was so circumscribed, and because in such cases pressure is exerted from the pleural cavity into the bronchus, rather than in the opposite direction.

In the second case, No. 76 (see remark), in which aspiration alone was used, the process seems, from the history, to have been tubercular, though a pneumonia was the exciting cause. The bacillus pyocyaneus was found in the fluid removed, but neither the tubercle bacillus nor the pneumococcus. Aspiration here was repeated several times, at intervals of a few months to two years or more, and the patient enjoyed fair health in these intervals. The last aspiration was done in April, 1898, and eighty ounces of a fluid resembling pea-soup were removed. This was filled with cholesterin crystals, as shown by the microscope, and contained the bacillus pyocyaneus.

The history of this case does not show that it properly can be considered as one of a true purulent pleurisy, for the reason that the examinations of the fluid removed did not give undeniable evidence of the presence of pus, although the temperature was a septic one. So far as can be learned, the patient has enjoyed immunity from any recurrence of the fluid, as he did for a time after each preceding aspiration.

The third case, No. 1, in which aspiration alone was used, was one in which sarcoma of the chest-wall was the exciting cause. The aspiration here was simply palliative, and need not be further commented on, the patient dying from the primary disease a few days later.

In thirteen additional cases aspiration of the chest-cavity was resorted to, and in each case this treatment proved to be inefficient, and a further operation had to be done, either incision in an intercostal space or resection of a rib. From these figures it is evident that we have little reason to hope that such a simple procedure of treatment in a case of purulent pleurisy will prove efficacious. There may be cases, however, and these will be considered later, in which this, as the proper treatment, should be tried.

Incision through an intercostal space was performed in 18 of the 76 cases, with the following results: 5 cures, 7 deaths, and 5 permanent fistulæ, for four of which resection of rib was done later. In one of the cases among those cured the fluid was sacculated, and had pointed below the border of the ribs prior to operation; in one a small sacculated empyema was situated deeply under the scapula, where resection was difficult of accomplishment; in two the patients were aged respectively one and four years, and in only one case (No. 41) was a general empyema of an adult present.

The cases ending fatally were divided as follows: 3 were moribund at the time of operation, and only survived a few hours; 2 were tubercular cases where the general infection had more to do with the termination than the empyema; 1 was in a double empyema where the patient was in very poor condition prior to operation; and 1 was in a case of general pyæmia with the empyema only one manifestation of this condition. Four of the 5 cases in which permanent fistulæ resulted were later treated by a resection and a cure apparently obtained, the remaining case having a fistula at the last report from it several months after operation.

These figures certainly give a very poor showing for the results of simple incision through an intercostal space. The mortality of 7 cases out of 17 cannot be entirely attributed to the lack of more heroic operation, as is evidenced in the recital of the cases dying, as given above. But only one cure of general empyema in an adult as against five resulting in fistula formation points very strongly to the fact that in such cases this procedure is inefficient. On the other hand, two cures in sacculated cases and two in children show that there may be cases in which such procedure is justifiable.

There remains for consideration the cases in which resection of rib was performed as the means best suited to evacuate the pus and establish good drainage of the pleural cavity thereafter.

This operation was done primarily in 43 cases, in 4 cases after incision had proved ineffectual, and in 12 cases after aspiration had proved so. The 4 cases in which incision preceded the resection have already been considered. This leaves 55 cases to be studied, and the following figures give the results obtained : Forty-five cures, 7 deaths, 2 fistulæ, and one unknown. The 45 cases showing a cure consisted of 24 above ten years of age, and of 21 under that age. Five were sacculated empyemata, one of which was in a child, and 40 were general empyemata.

The 7 cases dying were all adults. In one the fatal termination was directly attributable to a broncho-pneumonia which involved both lungs, as shown by the autopsy ; in one case a chronic endocarditis was a marked element in causing death ; in 2 cases a general tubercular infection was present ; and in 3 cases the empyema itself may be considered as the cause of death, though in 2 of these cases the patients were of exceedingly low resisting powers, owing to alcoholism and syphilis prior to contracting this disease, and one was afflicted with a subdiaphragmatic abscess which the empyema followed.

The 2 cases resulting in fistulæ were both in tubercular subjects having phthisis. In one of these (No. 4) an Estlander operation was done after the fistula had existed eight months without showing signs of healing. This procedure benefited the patient's general condition, but had failed to heal the cavity when last heard from, three years later.

Comparing the figures here obtained with those given as the result of the operation of incision alone there seems to be no question as to the infinitely greater value of the procedure of rib resection. The question then naturally arises, is the lesser operation ever justifiable, and has it any advantages over the greater. It is, of course, always advantageous to select the lesser of two equally efficacious operations, provided it can be shown that the greater is a more dangerous proceeding or accompanied with more shock or tends to leave a greater damaged condition of tissue as a sequela. But none of these reasons hold here so far as can be learned from the cases reported. In no instance is there any mention of the operation of rib resection, *per se*, having proved a danger to life, nor of its having been accompanied with any appreciable shock. In other words, it is not the more severe operation except in that it usually requires

the use of a general anæsthetic, and the bearing of this will be considered later. The loss of a piece of one or two ribs entails no lasting injury to the chest that the simple incision does not, and the liability to permanent fistula formation is much less. The question as to when, if ever, the lesser operation is justifiable will be answered in the summing up of all procedures of treatment at the end of this report.

The position at which the opening should be made has caused some discussion among surgeons and is undoubtedly a matter of considerable importance. An opening too high in the chest-wall may afford an opportunity for a large amount of pus to collect below it, and, on the other hand, an opening too low may later, as the lung expands to its normal extent, be closed by the rising of the diaphragm above it, thus stopping drainage. The first rule to guide the operator in this particular is to open the chest at a point where the pus exists, and this means the performing in every case of a preliminary exploratory puncture with an aspirating needle after the patient is on the table ready for operation. Failure to regard this precaution may give rise to considerable difficulty in reaching the pus, as evidenced in Case 24.

The cases herein reported show that in general the seventh or eighth rib in the posterior axillary line should be the point of election in a case of adult general empyema. No figures can be given to demonstrate the extent of rib that should be removed, but those cases in which one and a half to two inches of two ribs was taken away certainly appear to have given more satisfactory results than when a more limited operation was performed. This statement is made only after very carefully studying the full histories of the cases and taking into consideration all the points possibly bearing on the efficacy of any form of treatment.

The description of the operation of rib resection may be dismissed with a word. An incision of about three inches is made over the rib or ribs to be removed, the edges of the wound retracted, the periosteum elevated from the rib, taking the artery with it, and the desired length of bone taken away by means of the osteotome. The pleura is then incised freely, allowing access to the pleural cavity and the pus. The whole procedure should occupy from five to ten minutes. The possible accidents attending the operation are four: First the peritoneum may lie under the rib instead of the pleura.

This happened in one case herein reported, the sixth rib having been chosen and the preliminary exploration having been neglected. In case of such an accident a suture of the parts and the postponing of the real operation for a few days is the safest procedure, provided the patient's condition will admit of delay. If it will not, a careful suturing of the first wound, including the peritoneum if the incision was carried through that membrane, must be performed, and the wound protected with sterile collodion. With care in doing this the pleural pus may then be evacuated without harm. The second danger is from hemorrhage from an intercostal artery. This, as a rule, may be avoided by the precaution given above of stripping back the artery with the periosteum before cutting through the bone. If, however, it occurs, pressure for a few minutes will control it, or this failing, a ligature passed around it by means of a needle through the periosteum will answer. An attempt to tie the artery after catching it with forceps will probably fail, owing to its close attachment to the bone. No record of this accident having complicated matters is mentioned in the histories reported. Third, a piece of resected rib may fall into the pleural cavity, and great difficulty be experienced in removing it, even if its disappearance were noted. The precaution of firmly grasping the rib with forceps before cutting it will obviate this danger. In Case 20 this accident happened and the dead bone kept up an open sinus for two years.

The fourth accident to be considered is a sudden collapse and possible death of the patient when the pleura is opened and the pus evacuated, relieving the lung from its pressure. This, undoubtedly, has occurred, but it cannot be ascribed any more to the operation of rib resection than to that of simple incision; and in fact it has occurred while the chest was being aspirated for a simple serous pleurisy. In the cases reported, no mention of any serious collapse is made, and certainly no death took place under operation. The avoidance of such a calamity depends on keeping the patient from compressing the sound side, allowing the pus to escape slowly, and above all not opening the pleura while the patient is deeply anæsthetized. This phase of the subject is considered under the general one of the use of the anæsthetic which follows.

General anæsthesia was used in 59 cases where rib resection was performed, and was produced as follows: By chloroform, 40 times; ether, 16 times; nitrous oxide, once, and in 2 cases the means is not

given. Incision was performed six times under chloroform, twice under ether, twice under cocaine, and twice with no anæsthetic. The preference for chloroform seems justified when we consider that this vapor is the least irritating to the lung-tissue of the general anæsthetics, and that the time consumed is more of a factor than the production of deep anæsthesia. In fact, this latter is unnecessary, and should be avoided as tending to increase the danger. No mention of any accident from the anæsthetic is made in the records, but there are two which are worthy of consideration as possible. First, the collapse which sometimes occurs (alluded to above); and second, the inspiration of pus from the diseased pleura into the trachea, through a ruptured bronchiole on the affected side (brought about by sudden relief of pressure on the lung), and thence into the opposite lung, owing to the loss of the tracheal and laryngeal reflexes. The avoidance of these accidents lies in not producing deep anæsthesia at any time, and particularly at the time when the pleura is opened. This precaution, and the slow evacuation of the pus, brings the danger to the minimum. The cautious production of general anæsthesia is a safe procedure in most desperate conditions, as shown by Cases 15 and 53 of the table, and there seems to be no reason for not using it, when operation is justifiable at all.

Nothing connected with the subject of empyema has caused more controversy than the question of irrigation of the pleural cavity at the time of operation. At present the impression of the profession seems to be that such irrigation is not advisable, and it is even considered by many as contra-indicated. The reasons for this opinion are, that all the pus can be removed without such irrigation; that any hope of obtaining asepsis, or anything approaching it, is not worth considering, and that the procedure is not entirely devoid of danger. In only nine cases here reported was irrigation performed, and nothing in the histories shows whether the result was considered advantageous or otherwise. On the other hand, nothing approaching an accident is reported, and so far as these cases are concerned, no conclusion can be drawn either for or against this method of treatment. It may, however, be stated, that in those cases where such irrigation was used, the patient was always permitted to nearly recover from anæsthesia before throwing the fluid in, the precaution to have the fluid above body temperature was observed, and great care was taken to keep the outflow of the fluid continuous, so that

no great pressure could be exerted on the thoracic or abdominal viscera. These points were observed in order to avoid the fatal shock which has sometimes accompanied irrigation, and which constitutes the danger connected with it.

Done in this way, and given a case where the pus is fetid, or thick and flaky, there seems no real reason why irrigation should not be advised, and it certainly rests on sound surgical principles. A mild fluid will probably yield all the good result that a powerful antiseptic solution will, and such a substance as hydrogen peroxide ought to be precluded, from its tendency to get beyond control and possibly cause emboli in the circulation.

The means by which an empyematous cavity shall be drained is a matter of importance, but is not one requiring discussion. The rubber tube, usually double and perforated, answers every purpose, and was almost universally used in the seventy-six cases under consideration. It was inserted immediately after the operation, was held in place by some simple device of attachment, and was left *in situ*, except to be removed for cleaning, so long as the discharge continued copious. The length of tube was determined by the depth of cavity, and it was shortened as this lessened. The possible aid of such a foreign body toward forming a permanent fistula must be borne in mind, and the drain must not be used a longer time than necessary—this time, in the average case being apparently two to four weeks.

In some cases, *e.g.*, No. 25, the supplementing of the tube by gauze—preferably sterile, as iodoform may produce poisoning—exerted a good influence by aiding in the more rapid filling of the cavity.

The after-treatment in empyema is the same as that of any pus-discharging cavity—that is, to keep up drainage and aid as much as possible in stopping the septic forces at work. There has been, and still is, a lively discussion among surgeons as to how far irrigation of the pleural cavity is indicated in this stage of empyema. The objectors to it urge that, first, it does no good, and, second, it may do harm, and cite cases where irrigation at this time, as well as at the time of the operation, has apparently caused death.

Further, they argue that nature is doing all that can be done in the way of combating sepsis, and that complete drainage is the only assistance the surgeon can offer, and claim that the mechanical and

chemical irritation to the pleura by washing rather retards than aids the healing process. That death has occurred under such circumstances cannot be denied, but its possibility may be rendered very remote by proper precautions. It is difficult to understand why a mild fluid, such as Thiersch's solution, should in any way damage a pleura already thickened and fibrin-coated by the action of inflammatory processes. Moreover, there seems to be no good evidence that a solution of bichloride of mercury, 1 to 3,000 or 5,000, or a 1 to 150 solution of carbolic acid, does any appreciable harm under such conditions. On the other hand, there can be little doubt that these solutions do exert an inhibitory action on germ life under the circumstances here obtaining. No form of drainage can be so perfect that some pus will not collect from time to time in some part of the abscess cavity. Therefore, under proper precautions, the use of an antiseptic solution, or, at all events, of an aseptic solution, is apparently sound treatment. What constitutes such precautions? Place the patient in such position that he has complete power of expansion of the sound chest; keep the outflow of the fluid free, so that no undue pressure may be exerted; if a poisonous antiseptic solution is used follow it by the use of a non-poisonous solution, thus completely getting rid of all the former. This method certainly seems indicated in those cases where the discharge is becoming offensive and in those where the patient is absorbing septic material, as shown by the temperature chart and general clinical picture.

In the table here presented, under "after-treatment" are found all the cases treated either with or without irrigation. No positive figures can be stated to demonstrate the advantage of one method over the other, but a review of the histories certainly leaves the impression that irrigation proved beneficial. This is positively so stated by the historian in Cases 59 and 60, and is implied in many more.

Recently, Zeman has suggested and employed with good results a most efficient form of irrigation. The patient is placed in a sitz-bath of boiled water at a temperature over 100°, the water rising to a level just above the opening in the chest. He then respires rather deeply, and at each act water is drawn in and forced out from the cavity, carrying with it the collected pus. Fifteen minutes of this procedure washes the cavity absolutely clean. The objection to this method lies in the impossibility of having the fluid in which the

patient is immersed sterile. For notwithstanding the existing infected condition of the pleural cavity no aseptic precautions can be neglected in its after-treatment, as the introduction of fresh germ life may transform a weak septic poison into a virulent one. A thorough cleansing of the patient, however, before placing him in the bath and the employment of a large quantity of water would so dilute any infection that the danger from this would be very slight and might be disregarded in order to gain the advantages which this method seems to offer. The universal means of irrigation in the Presbyterian Hospital has been by means of force of gravity through a tube inserted into the pleural opening.

Conclusions.—A recapitulation of the treatment best suited to the varying conditions found in empyema as derived from a study of the cases here reported, emphasizes the important points. In very exceptional cases can the treatment by aspiration be considered advisable. A more accurate knowledge of the bacteriology of the subject may teach us that this method has a larger field of application than now appears. Simple incision should be reserved for uncomplicated cases in children, for very small sacculated collections of pus, and for those cases in which, owing to their general condition, the slightly more extensive operation of rib resection seems unadvisable. Even in the above conditions, however, rib resection proves in general more satisfactory, and it is an absolute essential in all other cases. Two inches of each of two ribs should as a rule be removed. The sixth, seventh, or eighth ribs, in the posterior axillary line, are in general best suited to make the position of the opening accomplish the most good. General anæsthesia by chloroform is advisable, but deep narcosis is dangerous. The irrigation of the abscess cavity at the time of operation is indicated when for any reason the pus otherwise cannot be evacuated, or where the pus is foul and the condition of the patient excessively septic. This procedure is somewhat dangerous and must be done with due caution. During the after-treatment irrigation is advantageous under the same conditions more liberally interpreted, and here an antiseptic solution may be used if the precaution is taken to wash it out with a mild solution immediately afterward.

Zeman's method of irrigation seems to be a good one.

Duration of the Cases After Operation.—The study of this heading has already been taken up under the various divisions of treat-

TABLE OF SEVENTY-SIX CASES OF EMPYEMA.

Case No. and Sex.	Age.	Preceding Condition.	Side.	Extent.	Anæsthetic.	Aspiration.	Incision without Resection	Resection of Rib.	Estimated Quantity of Pus.	Character of Pus.	Irrigation at time of Operation.	Bacteria Present.	Drain Used	After Treatment	Duration before Operation. Time Estimated	Duration after Operation.	Result.	Remark.
1. M.	29	Sarcoma of chest wall	Left	General	None	Yes	No	No	21 ounces	Thin; non-offensive	No	Streptococci	None	None	?	?	Death	The empyema was a complication of the sarcomatous condition. The latter was treated with erysipelas toxin, and this may have introduced the infection.
2. M.	33	Pleurisy (?)	Left	General	Ether	18 ounces; all pus removed	No	No	1 inch of sixth and seventh in axillary line	40 ounces	Not given	Streptococci	Tubes	Irrigation with Thiersch solution	10 days	3 weeks	Cure	Aspiration was done a week before the operation at intervals of two days. Speedy recurrence of pus showed absolute sufficiency of aspiration. Course short and without any complications.
3. M.	27	Pneumonia	Left	General	Ether	No	No	No	1½ inch of fifth in axillary line	30 ounces	Not given	No	Streptococci, pneumococci	Irrigation with Thiersch solution and drainage	10 days	3 weeks	Cure	Operation was performed by a serous effusion, in which pneumococci were found. After a week pus was found.
4. M.	36	Tuberculosis pneumonia	Right	General	Ether	No	No	On Jan. 18, 1894, 1½ inch of sixth, 1 in. of seventh, 1 inch of eighth, and 1 inch of ninth, and 1 inch each, eighth, ninth, tenth, in axillary line.	16 ounces	Very thick; much pus	No, but cavity thoroughly swept off at second operation.	None, no growth from pus	Tubes	Irrigation with Thiersch solution and drainage	Long standing	Improved	Improved	After first operation cavity reformed in three. After second two several conditions improved, but a lung cavity remained for months. Patient had family tuberculosis history and was himself tuberculous, alcoholic, and syphilitic.
5. ?	?	Pneumonia (?)	Right	General	Chloroform	No	No	1 inch, size not given	16 ounces	Yellow and fetid.	No	None found	Tubes	Irrigation with Thiersch solution and drainage	See remark	9 weeks	Cure	The lung condition, probably pneumonia, preceded the finding of pus by six months, but the patient was never entirely well and strong.
6. M.	11	Pneumonia	"	General	Ether	No	Twenty months prior to resection	No	½ inch of seventh in post axillary line	30 ounces	Thick with fibrin.	Walt normal salt solution.	Not given	No	6 weeks	6 weeks	Cure	The incision was followed by a permanent sinus for which the resection was done, and followed by a presumed cure, though patient was lost sight of before cavity completely closed
7. M.	3	Pneumonia	Right	General	Chloroform	No	No	½ inch of seventh in post axillary line	30 ounces	Thick with fibrin.	Walt normal salt solution.	Not given	Tubes	Irrigation with salt solution and drainage	3 weeks	2 weeks	Cure	Father died of phthisis.
8. F.	28	Pneumonia	Right	General	Chloroform	No	No	½ inch of fifth and sixth in axillary line	"Thimbleful"	Thick	No	Not given	Tubes	Irrigation with salt solution and drainage	3 weeks	2 weeks	Death	The aspiration caused a period of six months. The last one was done a week prior to the incision, and at that time the effusion was serous. He had a tubercular history, though no tuberculosis found.
9. M.	58	Tuberculous pleurisy	Right	General	Ether	Clear serum withdrawn at first	In sixth space	No	"Thimbleful"	Thin; non-offensive	No	No tubercle bacilli	Tubes	Irrigation with boric acid solution and drainage	2 weeks	2 weeks	Death	The empyema existed beneath costal arch and was here incised. Tuberculous family history.
10. M.	13	Pleurisy	Left	Sacculated	Chloroform	No	Before ribs	No	1½ inches	Thick; offensive	No	Not given	Gauze	Irrigation and drainage	6 weeks	2 weeks	Cure	The pneumonia preceded empyema a month, and an apparent cure had been effected when the latter suddenly developed and required aspiration.
11. M.	19	Pneumonia	Right	General	Chloroform	No	No	2½ inches of seventh in axillary line	16 ounces	Not given	No	Not given	Gauze and tubes	Drainage only	3 weeks	3 weeks	Cure	Autopsy showed double bronchopneumonia of unresolved origin.
12. M.	3	Pneumonia	Right	General	Chloroform	No	No	Seventh space	16 ounces	Thick, foetid(?)	No	Not given	Not given	Drainage only	2 days	2 days	Death	Pneumonia preceded empyema a month. Evidences of fluid only one week prior to operation.
13. M.	60	Pneumonia	Right	General	Chloroform	No	No	2½ inches of sixth in post-axillary line	32 ounces	Thick	No	Pneumococci	Tubes	Drainage only	4 weeks	2 weeks	Death	Child was in dangerous condition prior to operation, and death on table seemed imminent. Almost immediate improvement after operation.
13. M.	7	Pneumonia	Right	General	Chloroform	No	No	2 inches of sixth in post-axillary line	20 ounces	Thick, green	No	Not given	Tubes	Irrigation with salt solution and drainage	1½ weeks	1½ weeks	Cure	The aspiration of fluid fluid was three days prior to ab resection, when pus was present.
14. M.	31	Pleurisy	Left	General	Chloroform	18 ounces of thin fluid	No	No	½ inch of seventh in post-axillary line	32 ounces	Not given	No	No growth on culture media	Irrigation with salt solution and drainage	2 weeks	?	Cure	Father and brother died of phthisis.
15. F.	45	Tuberculous	Left	General	Chloroform	No	No	2 inches of seventh in post-axillary line	32 ounces	Not given	No	Not given	Tubes	Drainage only	4 days	2 weeks	Cure	Pneumonia was three weeks prior to resection, but no fluid could be found four days before resection. Erysipelas and streptococci were also present.
16. M.	54	Pneumonia	Right	General	Ether	No	No	1½ inch of seventh	40 ounces	Not given	No	Pneumococci and other	Tubes	Drainage only	1 week	1½ weeks	Death	A week before aspiration of pus the chest contained serum. No consolidations in lung were made out. Death result of surrounding pulse in empyema.
17. F.	13	Pneumonia	Left	General	Chloroform	No	Yes	2 inches of fifth and sixth in axillary line	20 ounces	Thick; fibrin	No	Not given	None	Drainage only	Open since he (?) years.	?	Cure (?)	Empyema followed pneumonia in 1890. Simple incision left open since. One tenth rib resected in 1894, cavity continued discharging. Two inches fifth and sixth rib resected in 1896, and cavity seemed to be closing when last seen two months later.
18. M.	49	Pneumonia	Right	General	Ether	15 ounces	No	No	1 inch of seventh in post-axillary line	30 ounces	Thick and fetid	No	Streptococci, pneumococci, tubercle bacilli	Irrigation with bichloride and salt solution. Drainage	2 weeks	3 weeks	Death	A serous pleurisy existed eight weeks before development of pus. During an irrigation a rupture into the bronchi took place and the patient died of coughing and strangling from pus from tuberculous sinus with ulcer.
19. M.	1	Pneumonia	Right	General	Chloroform	No	Ninth space	No	No pus	No	Not given	No	Tubes	Irrigation with salt solution	Drainage	3 weeks	3 weeks	Cure	Complicated with marked tuberculosis. Death resulted from this condition rather than from empyema.
20. F.	5	Pleurisy	Right	General	Chloroform	No	No	3½ inches of eighth in post-axillary line	40 ounces	Thick; fetid	No	Pneumococci, diplo bacilli	Tubes	Drainage only	10 weeks	4 weeks	Cure	Pleurisy complicated measles. No pneumococci present. Fluid from aspiration was only turbid. A rubber drain was inserted two days after aspiration, but was useless in draining cavity.
21. M.	5	Pleurisy	Right	General	Chloroform	20 ounces	No	1½ inch of eighth in post-axillary line; done two days after aspiration	64 ounces	Thin; yellow	No	Streptococci, pneumococci	Tubes	Irrigation with Thiersch solution. Drainage	5 days	12 weeks	Cure	Signs of fluid in chest developed April 17th and 40 ounces purulent fluid aspirated; on April 25th rib was resected and 25 ounces of pus evacuated. Pneumonia began April 1st.
22. M.	23	Pyelitis; no pulmonic lesion	Double	Sacculated	None	3½ ounces, right side; 6 ounces, left	No	No	No pus	Flaky	No	Not given	None	Experiments and exploration	1 week	10 weeks	Cure	Pus found in right chest behind, January 21, 1896, and aspirated, 3½ ounces of 1% ounces. January 26th; aspiration left posterior chest, February 19th, 5½ ounces. Began to experiment for Pleurisy with, combined ounces several with daily quantities of 3 to 3 ounces, cavities evidently completely drained in this way, for both the chest became normal and lung were doing full duty after ten weeks. Well at present time.
23. M.	23	Expectoration of pleurisy (?)	Left	General	Cocaine	18 ounces	South space	No	No pus	No	Thiersch solution	Not given	Tubes	Drainage and tamponade	4 weeks	3 hours	Death	Patient alcoholic. Aspiration three eight days prior to incision. Further interference at that time refused, and death resulted from this delay.
24. M.	39	Tuberculosis	Left	General	Ether	No	No	½ inch of seventh in axillary line	15 ounces	Yellow; thin	No	Not given	Tubes	Drainage only	6 weeks	2 weeks	Death	Complicated by pulmonary and intestinal tuberculosis.
25. F.	3	Unknown	Left	General	Ether	No	No	½ inch of seventh in axillary line	32 ounces	Thick	No	Not given	Tubes	Drainage only	6 weeks	10 weeks	Death	Patient was in almost dying condition when operated on.
26. F.	30	Pneumonia	Left	General	Not given	No	No	1½ inch of seventh in post-axillary line	48 ounces	Thin; yellow	No	Not given	Tubes	Drainage only	3 weeks	2 days	Death	Patient alcoholic and syphilitic. Chest sounds found in chest eight days prior to operation; pus only four days.
27. M.	17	Pleurisy	Left	General	Ether	No	No	½ inch of seventh in axillary line	40 ounces	Thin; green	With Thiersch solution.	Not given	Tubes	Drainage only	10 weeks	6 weeks	Cure	Pleurisy preceded operation three months. Appearance of pus estimated from clinical symptoms.
28. M.	45	Pleurisy	Left	General	Chloroform	No	No	Nine	No	Seventh space	No	Not given	Tubes	Irrigation with Thiersch solution and drainage	15 weeks	?	Cure	Pleurisy preceded operation three months. Date of formation of pus uncertain.
29. M.	16	Pneumonia	Left	Sacculated	Chloroform	16 ounces	No	1½ inch of eighth in post-axillary line	32 ounces	Thick; fibrin	No	Not given	Tubes	Irrigation with Thiersch solution and drainage	1 week	8 months	Cure	Aspiration preceded resection by six weeks. Phthisis developed later. Removed from the complaint, and in 1899, after seven years, is well.
30. F.	3	Pleurisy	Right	General	Chloroform	No	No	1 inch of eighth in axillary line	20 ounces	Not given	No	Streptococci	Tubes	Drainage only	1 week	Unknown	Unknown	Sinuses left developed a week after operation, and patient went to another hospital. Further data of phthisis.
31. M.	26	Pneumonia	Right	Sacculated	Chloroform	No	No	2 inches of eighth in post-axillary line	Small	Not given	No	Not given	Tubes	Drainage only	3 weeks	3 weeks	Cure	Cavity small and situated in axillary line at eighth rib.
32. M.	2	Unknown	Right	General	Chloroform	No	No	1½ inch of eighth in axillary line	20 ounces	Not given	No	Not given	Tubes	Irrigation with Thiersch solution and drainage	2 weeks	2 weeks	Cure	Patient was almost dying condition when operated on.
33. F.	3	Pneumonia	Left	General	Ether	No	No	1 inch of seventh in post-axillary line	35 ounces	Thick; yellow	No	Not given	Tubes	Drainage only	12 weeks	12 weeks	Cure	Patient alcoholic and syphilitic. Chest sounds found in chest eight days prior to operation; pus only four days.
34. M.	30	Pneumonia	Left	General	Not given	No	No	½ inch of seventh in post-axillary line	48 ounces	Thin; green	No	Not given	Tubes	Irrigation with salt solution and drainage	4 days	4 days	Death	Cavity bound by bone portion of chest.
35. M.	53	Expectoration of pleurisy (?)	Left	General	Cocaine	18 ounces	South space	No	No pus	No	Thiersch solution	Not given	Tubes	Drainage and tamponade	4 weeks	3 hours	Death	Patient alcoholic and syphilitic. Chest sounds found in chest eight days prior to operation; pus only four days.
36. M.	39	Tuberculosis	Right	General	Cocaine	No	Eighth space	No	No pus	No	No	Not given	Tubes	Drainage only	6 weeks	2 weeks	Death	Complicated by pulmonary and intestinal tuberculosis.
37. F.	3	Unknown	Left	General	Ether	No	No	½ inch of seventh in axillary line	15 ounces	Thick	No	Not given	Tubes	Drainage only	6 weeks	10 weeks	Death	Patient was almost dying condition when operated on.
38. F.	3	Unknown	Left	General	Ether	No	No	1 inch of seventh in post-axillary line	36 ounces	Not given	No	Not given	Tubes	Drainage only	6 weeks	10 weeks	Cure	
39. F.	20	Pneumonia	Left	Sacculated	Ether	No	No	½ inch of seventh in post-axillary line	48 ounces	Thick; foul	No	Not given	Tubes	Drainage only	2 weeks	6 weeks	Cure	Cavity bound by bone portion of chest.
40. M.	17	Pleurisy	Left	General	Ether	No	No	1 inch of sixth in axillary line	60 ounces	Thin; greenish	With Thiersch solution.	Not given	Tubes	Drainage only	10 weeks	6 weeks	Cure	Pleurisy preceded operation three months. Appearance of pus estimated from clinical symptoms.
41. M.	32	Pleurisy	Right	General	None	No	Seventh space	No	No pus	No	Not given	No	Not given	Tubes	Irrigation with Thiersch solution and drainage	15 weeks	?	Cure	Pleurisy preceded operation three months. Date of formation of pus uncertain.
42. M.	45	Pneumonia	Left	General	Chloroform	16 ounces	No	1½ inch of eighth in post-axillary line	32 ounces	Thick; fibrin	No	Not given	Tubes	Irrigation with Thiersch solution and drainage	1 week	8 months	Cure	Aspiration preceded resection by six weeks. Phthisis developed later. Removed from the complaint, and in 1899, after seven years, is well.
43. L.	3	Pleurisy	Right	General	Chloroform	No	No	1 inch of eighth in axillary line	20 ounces	Not given	No	Streptococci	Tubes	Drainage only	1 week	Unknown	Unknown	Sinuses left developed a week after operation, and patient went to another hospital. Further data of phthisis.
44. M.	26	Pneumonia	Right	Sacculated	Chloroform	No	No	2 inches of eighth in post-axillary line	Small	Not given	No	Not given	Tubes	Drainage only	3 weeks	3 weeks	Cure	Cavity small and situated in axillary line at eighth rib.
45. M.	2	Unknown	Right	General	Chloroform	No	No	1½ inch of eighth in axillary line	20 ounces	Not given	No	Not given	Tubes	Irrigation with Thiersch solution and drainage	2 weeks	2 weeks	Cure	
46. F.	10	Pneumonia	Left	General	Ether	No	No	1 inch of seventh in post-axillary line	35 ounces	Thick; yellow	No	Not given	Tubes	Drainage only	12 weeks	12 weeks	Cure	
47. M.	50	Pneumonia	Left	General	Not given	No	No	1½ inch of seventh in post-axillary line	36 ounces	Thin; foul	No	Not given	Tubes	Stimulation and drainage	4 days	1 day	Death	
48. M.	8	Pneumonia	Left	General	Chloroform	No	No	1½ inch of sixth in axillary line	30 ounces	Thick	No	No growth on serum	Tubes	Irrigation with salt solution and drainage	2 weeks	2 weeks	Cure	
49. F.	11	Unknown	Right	General	Chloroform	No	Yes, a year prior to resection	1½ inch of eighth in axillary line	Not given	Thick	No	Not given	Tubes	Irrigation with salt solution and drainage	Chronic since for 1 year.	4 weeks	Cure	After first incision the cavity would stop discharging for a time and then break out again
50. F.	17	Pneumonia	Left	General	Chloroform	No	No	1½ inch of eighth in post-axillary line	40 ounces	Not given	No	Not given	Tubes	Drainage only	2 weeks	3 weeks	Cure	
51. F.	23	Tuberculous pneumonia	Right	Sacculated	Chloroform	No	No	1½ inch of seventh in post axillary line	32 ounces	Thin	With Thiersch solution.	Pneumococci	Tubes	Irrigation and drainage	1 week	?	Improvement	Pneumonia followed 10 days of ether for extraction of tooth. Phthisis developed month later in lung.
52. M.	19	Pneumonia	Right	General	Chloroform	No	Yes	1½ inch of seventh; done ten months after incision	Not given	Not given	No	Not given	Tubes	Drainage only	10 months	2 weeks	Cure	Cavity continued discharging after simple incision.
53. M.	24	Grippe pneumonia	Left	General	Chloroform	No	Seventh space	Part of seventh in post-axillary line two weeks after incision	Not given	Not given	No	Pneumococci	Tubes	Irrigation with boric solution and drainage.	3 weeks	3 months	Cure	Patient was almost moribund at time of incision. After that rallied a little but was in desperate condition for month after resection.
54. M.	8	Pneumonia	Right	General	Chloroform	No	No	1 inch of seventh in post-axillary line	64 ounces	Thick; non-fetid.	No	No tubercle bacilli	Tubes	Irrigation with bone solution and drainage.	3 weeks	1 month and more.	Cure	A second resection was done three months later. Cavity still discharging for a month after that, though apparently filling up.
55. M.	8	Osseous pleurisy.	Right	Sacculated	Chloroform	No	No	1 inch of seventh in post-axillary line	5 ounces	Not given	No	Not given	Tubes and gauze	Irrigation with ½ per cent. creoline and drainage	1 week	?	Cure	Case lost sight of before cavity was closed.
56. M.	44	Phthisis	Right	General	Chloroform	No	No	1½ inch of seventh in post-axillary line	Large	Not given	No	Not given	Tubes and gauze	Irrigation with ½ per cent. creoline and boric solution. Drainage	6 weeks	3 weeks	Cure	Same as preceding case.
57. M.	2	Diphtheria	Right	General	Not given	No	No	2 inches of eighth in post axillary line	48 ounces	Thick; foul	No	None found, no growth on serum	Tubes	Irrigation with boric solution and drainage	2 weeks	6 weeks	Cure	Diphtheria preceded pneumonia by three months.
58. M.	13	Tuberculosis	Left	General	None	No	Seventh space	No	No pus	No	No	Tubercle bacilli	None	None	See remarks.	4 hours	Death	Indefinite tubercular history for four months. Indications of empyema only ten days. Methods in abdomen.
59. M.	16	Pneumonia	Right	General	Ether	No	No	2 inches of fifth in anterior axillary line	Large	Thin; non-fetid.	No	Pneumococci, streptococci, bacillus.	Tubes and gauze	Irrigation with carbolic 1 to 100 o. d. Drainage. See remarks.	2 weeks	4 months.	Cure.	The pus was becoming foul and more abundant when carbolic irrigation was begun. This created a foetid and offensive discharge.
60. M.	6	Pneumonia	Right	General	Chloroform	No	No	2½ inches of seventh	32 ounces	Not given	No	No growth on serum	Tubes and gauze	Irrigations with carbolic 1 to 100. ½ per cent. creoline and boric solution	2 weeks	3 weeks	Cure.	Carbolic irrigation effected same results as in preceding case.
61. F.	23	Not known													See remarks	10 weeks	Cure.	There was necrosis of rib following operation for empyema done six months previously at another hospital. History of this unknown.
62. M.	2	Pneumonia. See remarks.	Left	General	Nitrous oxide	No	No	2 inches of seventh in post axillary line	32 ounces	Not given	No	Not given	Tubes	Irrigation with carbolic 1 to 100. Drainage.	1 week	19 weeks	Cure.	Pneumonia preceded empyema two years, and an apparent complete recovery was made from the former, good health existing in interval.
63. F.	30	Pleurisy	Left	General	Chloroform	No	No	3½ inches of seventh in post-axillary line	No given	Very thick	With nitrous oxide, the globule being too thick to escape	Streptococci	Tubes	Irrigation with carbolic 1 to 100	1 week	3 weeks	Cure.	
64. M.	39	Pneumonia	Right	General	Chloroform	No	No	1 inch of seventh in post-axillary line	Large	Not given	No	Staphylococci, streptococci,	Tubes.	Drainage only	1 week	8 weeks.	Cure.	
65. M.	32	Pleurisy, tuberculous	Right	General	Ether	No	No	2 inches of seventh in post-axillary line	No ounces	Thin	No	No growth, no tubercle bacilli	Tubes	Irrigation with carbolic 1 to 100. Drainage.	1 week	1 month	Cure.	
66. M.	3	Pneumonia	Right	General	Chloroform	No	No	1 inch of seventh in post-axillary line	Large	Thick; yellow	No	Micrococci lanceolati	Tubes	Irrigation with creoline ½ per cent.	4 weeks	3 weeks	Cure.	The preceding condition and the duration of empyema prior to operation are unknown.
67. M.	13 months	Unknown	Left	General	Chloroform	No	No	1½ inch of seventh in post-axillary line	Not given	Not given	No	Not given	Tubes	Irrigation with boric solution	3 weeks	3 weeks	Cure	
68. F.	3	Unknown	Right	General	Chloroform	No	No	1 inch of seventh in post-axillary line	Large	Not given	No	Not given	Tubes	Drainage only	3 weeks	3 weeks	Cure	
69. M.	2	Pneumonia	Right	General	Chloroform	No	No	1½ inch of sixth in post-axillary line	Large	Thick; yellow	No	Micrococci lanceolati	Tubes	Irrigation with creoline ½ per cent.	3 weeks	3 weeks	Cure	
70. F.	3	Pleurisy	Right	General	Chloroform	No	No	Yes, pus not given	Large	Thin	No	Micrococci lanceolati	Tubes	Drainage only	3 weeks	3 weeks	Cure	
71. M.	9	Pleurisy	Right	General	Chloroform	No	No	2 inches of seventh in post axillary line	No given	Not given	No	No tubercle bacilli	Tube and gauze	Drainage	3 weeks	3 weeks	Cure	
72. M.	23	Pneumonia, pleurisy	Right	General	Ether	No	Bloody fluid	No	No pus	Not given	Yes, and pleura wiped out with gauze.	No growth on culture media.	Tubes	Irrigation with carbolic 1 to 100 and Thiersch solution. Drainage.	2 weeks	3 weeks	Cure	
73. F.	42	Pleurisy	Right	General	Ether	No	No	2 inches sixth and seventh in axillary line	Large	Thick	No	Micrococci, lanceolati	Tubes	Drainage	3 weeks	4 weeks	Cure	
74. M.	49	Subdiaphragmatic abscess	Left	General	Ether	No	No	No	No pus	No	No	Not given	Tubes	Irrigation with creoline ½ per cent. and hydrogen peroxide.	2 months	See remarks.	Fistula (?).	Sinus was still discharging after three months, and the incision seems to have failed in effecting a cure.
75. M.	36	Pneumonia, pleurisy	Left	General	None	See remark	No	No	See remarks.	Pea soup appearance.	No	No tubercle bacilli, bacillus typhosus.	Tubes.	Drainage only	Indefinite but short.	4 weeks	Died	Cause of abscess unknown. Empyema was result of infection travelling upward.
76. M.	3	Pneumonia	Left	General	Chloroform	No	No	1 inch of seventh in post-axillary line	32 ounces	Thick; yellow	No	Not given	Tubes	Irrigation with boric solution and drainage	3 weeks	3 weeks	Cure	Pneumonia in 1894. Year later 125 ounces serous fluid aspirated from left chest. This repeated three or four times during next year; apparent recovery. In 1895 a few ounces pea-soup pus aspirated; recovery. In November, 1897, four ounces of same fluid, containing many pus-cells and cholesterin crystals was removed. In April, 1898, 80 ounces of same fluid again aspirated.

ment, the outcome of any treatment having always been reported with respect to this point. It may be added that the usual time for the healing of an uncomplicated general empyema in an adult was from six to ten weeks after operation, with the extremes of three and twenty weeks. In children a month may be considered a fair average, though many of these cases proved as long and tedious as in older patients.

Results.—The deaths among the entire 76 cases numbered 15; the cases resulting in permanent fistula formation numbered 5; and the cures numbered 46. Among the 5 resulting in fistula formation are 2 that were lost sight of too early to be positive that this condition remained permanent, so that this number may be reduced to 3.

Among the 15 fatal cases, 5 were preceded by pneumonia. Two of these showed only the pneumococcus in the pus; 1 showed an indeterminate coccus, and 2 were not examined bacteriologically. That is one-third of all the cases ending in death followed pneumonia, and in nearly one-seventh of all such cases the pneumococcus was found and in another seventh no examination was made, and these may properly be disregarded in making up percentages. These figures certainly do not show that empyema following pneumonia is benign nor that the pneumococcal infection is a mild one, as stated by Whitney and previously quoted. The fallacy of this contention is further emphasized by the fact that among the remaining ten cases, 1 died of sarcoma of the chest-wall, 1 of a general pyæmia, 1 of subdiaphragmatic abscess, 3 of tuberculosis other than that in the pleura, and 1 of endocarditis, leaving only 3 cases dying from uncomplicated empyema and not following pneumonia, against 5 such with pneumonia as the preceding condition.

Only two fatal cases occurred in children, thus demonstrating the fact that empyema though very common in this class has a low mortality.

The total mortality attributable to the empyema itself was eight cases, or ten and a half per cent.

XV.

A REPORT OF TWENTY-EIGHT CASES OF SUPPURATIVE HEPATITIS.

By Stuart Hart, M.D.,
late house surgeon.

During the past twenty years the following cases of abscess of the liver have been treated in the Presbyterian Hospital. They are interesting as showing the various types of this disease which enter the service of a large general hospital in this city. The small number of cases occurring in such a large and extended service would go to demonstrate the comparative rarity of this lesion in our section of the country. It may be noted that the Presbyterian Hospital does not include among its patients the large number of sailors who have been engaged in the foreign merchant marine service, such as have been so prolific in furnishing the London hospitals with so considerable a number of these patients, and that therefore this set of cases represents more strictly local conditions.

The difficulties of obtaining accurate histories, due to the lack of intelligence of the patients or to their grave physical condition, are those common to the service of any large hospital drawing its patients from all grades of society, and this fact, together with the small number of cases which could be accurately classified in each of the several groups, has rendered it inadvisable to draw any but the most general conclusions.

ETIOLOGY.

Perhaps the most interesting features brought out by such a collection are the etiological factors.

We may roughly, for our purpose, group the cases according to the path by which the infection has reached the liver, viz.:

	Cases.
I. Entrance by way of the portal vein	17
II. Entrance by way of the hepatic artery	3
III. Entrance by way of the bile-passages	2
Unclassified	6
Total	28

IREE CA

IE LIVER.*

		Course.	
on: *a*, Be- Admission; Admission. aracter.		Termi- nation.	Onset..
eeks..... eks. eptic.		Died...	Pain...
..... ys. eptic.		Died...	.....
months..... nonths. eptic.		Died...	Pain...
pital 1 day..		Died...	.....
onths..... onths. eptic.		Died...	Pain...

on of the earlier cases.

TABLE OF FIVE CASES OF ABSCESS OF THE LIVER.*

Case Number.	Attending Physician or Surgeon.	Name and Date of Admission.	Sex, Age, and Civil Condition.	Occupation and Nativity.	Etiology: *a*, Predisposing; *b*, Exciting.	Symptoms. Icterus.	Stools, Number and Character.	Urine (specific gravity).	Local Inspection.	Pain, Location and Character.	Tenderness, Location.	Liver.	Lungs.	Course. Duration: *a*, Before Admission; *b*, After Admission. Character.	Termination.	Onset.	Complications.	Treatment.	Abscesses. Number.	Size.	Location.	Pathological Condition found at Autopsy.	Remarks.
24	Dr. Northrup	H. S., Dec. 1, '97	Male, 36, single	Laborer, United States.		No	Diarrhœa, yellow fluid.	Albumin, trace; casts, granular and hyaline; 1030.	Bulging of right lower chest.	Epigastric, right lower costal.	Slight epigastric.	Sixth rib to 2 inches below free margin in para-sternal line.		*a*, 4 weeks. *b*, 8 weeks. Septic.	Died	Pain		Refused operation. Aspirated.				No autopsy	No Widal's reaction. No typhoid bacilli in stools. No growth from blood culture. No malarial organisms. Hæmoglobin, 47 per cent. Leucocytes, 19,000–33,000.
25	Dr. McCosh	H. C., Dec. 24, '97	Male, 23, single	United States.		No					Right lower chest.		Compression right.	*a* *b*, 7 days. Septic.	Died		Peritonitis, right empyema, chronic congestion kidneys.	Empyema opened by resection of rib.	Multiple	One large, several small.	Upper part of right lobe.	Few clusters of small abscesses scattered through liver. Diaphragm perforated.	
26	Dr. James and Dr. McCosh.	G. F., Nov. 15, '98	Male, 35, single	Civil Engineer, United States.	*a*, Alcoholism; *b*, Ulcerative colitis.	Yes	Regular, clay colored.	Albumin; casts, few granular; 1012–1030.		Sharp attacks, region of gall-bladder radiating to right costal and scapula regions.	Right hypogastric and hypochondriac.	Fifth space to costal margin; left lobe felt.	Normal	*a*, 10 months. *b*, 12 months. Septic.	Died	Pain	Ulcerative colitis, empyema.	Resection of ninth rib. Vertical abdominal incision outer side right rectus, abscess drained.	Multiple	One 800 c.c., others small.	Right and left lobes.	Ulcers of colon, particularly of caput coli. Diaphragm perforated.	Bloody expectoration, no tubercle bacilli found. Widal's reaction present. Typhoid bacilli obtained from culture taken from gall-bladder.
27		K. K., March 27, '99	Female		*b*, Appendicitis									In hospital 1 day.	Died		Appendicitis, pericarditis, peritonitis, double empyema.		One	1200 c.c.	Right posterior part of right lobe.	Peritoneal adhesions, appendicitis, pericardtis, empyema (double).	No history obtained; patient moribund on admission.
28	Dr. Northrup and Dr. Briddon.	W. McG., Sept. 24, '99	Male, 32, single	Laborer, United States.	*a*, Alcoholism; *b*, Ulcerative colitis.	No		Albumin; casts; 1012–1030.		Slight, right lower chest and right shoulder.		Fifth space to free margin; not felt.	Compression right.	*a*, 5 months *b*, 6 months. Septic.	Died	Pain	Ulcerative colitis.	Rib resected. Abdominal incision along costal margin. No pus found.	One	500 c.c.	Posterior part of right lobe.	Diaphragm adherent and very thin over abscess. Ulcers of caput coli.	No malarial organisms found. Polymorphonuclear leucocytosis 14,000–20,000. No tubercle bacilli in sputum.

* These are five cases collected in the past two years, since the tabulation of the earlier cases.

s.	CESSES.				
Loss of Flesh and Strength.	Loc-	Locality.	Pathological Conditions found at Autopsy.	General Remarks.
Yes.	.....	Upper surface right lobe, through diaphragm into pleura and lung.	Diaphragm perforated, lung and pleura contain a pint of thick pus.	Expectoration of blood and pus (no liver-cells) beginning five weeks before admission, and continuing until death.
Yes.	Bul hy	right Right lobe.....	Single abscess occupying whole of right lobe of liver.	Absence of peritoneal adhesions and adhesions above and laterally made second incision advisable; very bad general condition before operation.
Yes.	Bul hy	..... Right lobe, lower part.	No autopsy.....	Heart dilated, mitral lesion. Exploring-needle inserted below ribs 1 inch to right of median line; thin purulent fluid obtained

TABLE OF TWENTY-THREE CASES OF ABSCESS OF THE LIVER.

I. *Infection through the Portal Vein.*—One is at once struck with the frequency with which lesions of the alimentary canal are met with in these cases. Actual anatomical lesions of the alimentary tract were found in 10 cases on autopsy, and in 7 others the symptoms presented gave evidence of intestinal lesions, in which the recovery of the patient or the failure to obtain an autopsy rendered post-mortem verification impossible. Of these lesions, ulceration of the colon and caput coli stand out prominently, these being found in 6 cases; 3 cases (like a case reported by Burrell and Bottomley, of Boston *) had their origin in an inflammatory process in the vermiform appendix, all being of the ulcerative variety, one having actually perforated. One case on autopsy demonstrated an ulcer of the stomach as the primary lesion. Of the remaining cases of this group one gave evident symptoms of a severe enteritis, and five of colitis of varying grades of intensity. In none of these patients was the amœba coli demonstrated, although a search was made for it in most of them. As the amœba was not found, it seems questionable to designate any of these strictly as tropical abscess, and yet undoubtedly some of them belong to that category, as is evidenced by Case 11 of the series. This patient, a native of Bohemia, some five years before coming under observation at this hospital, was employed on some excavations in Egypt, and in common with a number of fellow-workmen, was stricken with symptoms quite typical of amœbic colitis, and subsequently developed an abscess of the liver which was evacuated by an incision, the scar of which was noted on his admission to the Presbyterian Hospital. At the time of his admission he gave evidence of a severe colitis, but careful search failed to discover any amœbæ in the stools; later he developed a hepatic abscess of enormous dimensions.

In another case of the series (9), in which there was evidence of an inflammatory condition of the small intestine, the patient on one occasion vomited a round worm, and although this was the only one found, it may well have been the early irritant which induced the inflammatory process. In 5 out of 36 cases of liver abscess in children, reported by Musser,† he places ascarides as the causative factor.

* Burrell and Bottomley: Medical and Surgical Report of the Boston City Hospital, 1898, p. 131.

† Musser: Keating's Cyclopædia of Diseases of Children, Art. "Abscess of Liver."

As has been pointed out by Councilman and Lafleur,* liver abscess occurs much more frequently in the dysenteries of the tropics than in those of the temperate zones, evidencing its close association with dysenteries of amœbic origin. Thus in autopsies on 2,590 cases of tropical dysentery collected by them, liver abscess was found in 507. While this lesion was never met with (in dysenteries) by Rokitansky, or in 231 autopsies made by Finger, Cheyne reported 5 abscesses in 30 autopsies on patients suffering from dysentery in Ireland; Fox, of St. Louis,† reported 5 in 30 autopsies; Woodward, 16 in 383 cases of dysentery, and rare cases by Dickinson and Moore on patients who had never been outside of England. It is notable that in the majority of the cases here presented dysentery was prominent.

In none of the cases of this series were the ulcerations considered tubercular, while in but one was a typhoid origin established (Case 26 showing a typical Widal's reaction in the blood and affording a culture of the typhoid bacillus from the gall-bladder). This agrees with the statements of Semnola and Gioffredi, ‡ that ulcers in the intestine of tubercular origin never produce abscess of the liver, and typhoid ulcerations rarely. In the pus of abscess of the liver the typhoid bacillus has been found by Lannois, § and the tubercle bacillus by Churton, ‖ but neither of these were found in the pus of any of the cases of this series.

The avenue of infection is well demonstrated for this group by Case 16, in which the original suppurating focus in the appendix caused a portal pyelo-phlebitis, and the suppurative process could be traced along the branches of the portal vein. Case 20, following an ulcer of the stomach, presented a somewhat similar condition, with the additional formation of septic thrombi.

Of the predisposing conditions noted in this group, alcoholism was present in 3 cases and grippe in 1. Of the 17 cases 11 were in males and 6 in females. The age ranged from eighteen to eighty years, 13 cases occurring in the decade and one-half from twenty-

* Councilman and Lafleur: Johns Hopkins Hospital Reports, 1890–1891, Art. "Amœbic Dysentery"

† Fox: St. Louis Medical Archives, Vol. III., 1869.

‡ Semnola and Gioffredi: Twentieth Century Practice, Vol. IX., p. 549. Art. "Diseases of the Liver."

§ Lannois: Revue de Medecine, November, 1895.

‖ Churton: Lancet, March 9, 1895.

eight to forty-three. The patients presented themselves for admission to the hospital in every month of the year excepting January and April. Nativity seems to have had no bearing as a causative factor. All were hard-working men and women, none of them of sedentary pursuits.

II. *Infection through the Hepatic Artery.*—Of the tabulated cases 3 were part of a general pyæmic process (2 of them secondary to malignant endocarditis, and the third followed puerperal sepsis).

In each of these cases, however, it is quite possible that the infection entered the liver by way of the portal vein, as a colitis, a general peritonitis, and infarcts in the spleen were present in the respective cases, each representing areas drained by the portal system, making it questionable whether we are justified in considering the infection as directly of arterial origin. The protection afforded the liver by the lungs (through which the infection must pass in general pyæmic cases) has been pointed out by Waldeyer,* who, in autopsies on pyæmic cases, found pulmonary infarcts in sixty-six per cent. against hepatic infarcts of but six per cent.

III. *Infection through the Bile-Passages.*—That the bile-passages are frequently the path of entrance of hepatic infection has been shown by Kartulis, † who believed that at times the amœba thus gained access to the liver, while infection through these, induced by the irritation of calculi, ‡ has often been demonstrated.§

In two cases of this series calculi occluded the common duct, and may be considered the immediate cause of the suppurative process. One case recovered by rupture through the lung, the other died on the day following admission to the hospital.

COURSE AND SYMPTOMS.

The course of these cases was that of a septic process (usually of a considerable duration associated with a progressive emaciation and exhaustion) with fever of an irregular type (occasionally con-

* Abbe: American Text-Book of Surgery, Vol. IV., p. 548.

† Kartulis: Virchow's Archiv, Bd. 118, 1889. Art. "Zur Aetiologie der Dysenterie in Aegypten."

‡ Covert: Chicago Medical Times, August, 1895.

§ Geigel: Zeit fur Klin. Med., B. 16, H. 3, 4, 1889. Koth: Deut. Med. Zeit., July 28, 1892.

tinuous) and a corresponding pulse of great variability in force, character, and frequency. Vomiting was often present and as often absent. Chills were frequently present at the onset and occurred occasionally in the course of the disease, accompanied usually by sweating. There was no periodicity in the chills, though with the associated enlarged spleen they were often sufficiently severe to suggest the probability of a malarial infection, until this was eliminated by repeated examinations of the blood and the administration of quinine.

Icterus was not a prominent symptom, occurring in only 6 cases, and of these 3 had only a slight discoloration of the skin and eyes. In both cases associated with calculi, icterus was present. That this symptom (as has been claimed) is due in a large measure to a destruction of liver parenchyma is not borne out by these cases, as in the patients in whom the destruction of liver-tissue was greatest there was no jaundice, while the cases in which icterus occurred were those of multiple abscesses, or of comparatively small single abscess with moderate destruction of liver parenchyma. It seems more probable that the jaundice in these cases was due to the occlusion of the bile-passages by calculi, inspissated bile, pressure of an abscess on the ducts, or an associated catarrhal condition of the bile-passages. It may be noted here that jaundice was never considered a contra-indication to operation. Icterus, as a cause predisposing to hemorrhage, although frequently mentioned in the literature and occasionally encountered by surgeons, has not, in any of these cases, been found to increase the difficulty of controlling hemorrhage.

Stools.—The character of the stools has been that which one would expect with the associated lesions of the alimentary tract. With the occlusion of the bile-passages the stools were light or clay-colored and constipated. With colitis they were in general fluid, frequent, and streaked with blood and mucus. In none of the cases was the amœba coli found.

Pain has been a very constant symptom, in only 3 cases was it absent. It was referred constantly to the right hypochondriac and epigastric regions. The severity was more marked in the cases with a single large abscess, and was greatly dependent upon a supervening perihepatitis or peritonitis. Pain radiating to the shoulder, which has always been considered one of the classical symptoms of this lesion, was sufficiently prominent to be noted by the historian

in only 2 of the 28 cases. Tenderness of the liver area was usually present.

On physical examination *the liver* was usually found enlarged; the exceptions to this general rule were those of multiple abscess. The enlargement was usually upward, but not invariably so, and in one or two instances the liver could be made out on a level with the umbilicus. Not infrequently it was impossible to define the limits of hepatic dulness on account of a coincident or resulting empyema.

Changes in mental condition were those associated with the septic nature of the disease. Analysis of the urine showed evidence of affections of the kidneys, from the mildest grades of degeneration to the severe forms of nephritis.

The upward enlargement of the liver was frequently sufficient to give evidence of compression of the lung, more particularly of the right side. The frequent occurrence of a pleurisy or empyema, and the tendency of the liver abscess to work its way upward seems to us conclusive evidence that the infection of the pleural cavity in these cases is by penetration through contiguous structures.

Termination.—In considering the outcome of these cases of liver abscess it is to be borne in mind that a large proportion of the patients had been ill for a very long period, several of them with no, and the larger number with very inadequate, medical observation. In 8 of the 28 cases the patients were in a moribund condition on admission to the hospital, and lived for only a few hours after their admission. Of the remaining 20 only 3 recovered, 2 after evacuation of the pus by operative procedure, and 1 by rupture into the lung and expectoration of the contents of the abscess.

Immediate Cause of Death.	Moribund on Admission.	Total.
General sepsis	6	16
General peritonitis	2	6
Malignant endocarditis and sepsis	0	2
Septic pneumonia	0	1
	8	25

In case No. 18 the general peritonitis was secondary to the operation performed in two stages, the adhesions being broken down by an attack of coughing.

All the cases that recovered were presumably those of single abscess.

TREATMENT.

Of the 28 cases 13 were deemed unsuited for operation, and of these one recovered by rupture into the lung. In one case operation was advised, but was refused by the patient, and the remaining 14 were operated upon.

Among the elements contra-indicating operative interference were malignant endocarditis, septic pneumonia, rupture into lung, and the general condition of the patient, which did not warrant subjecting him to shock.

The various operative methods are well represented in the series.

Laparotomy in two stages was performed in Case 18 of the series, the adhesions formed satisfactorily, but were torn away by a fit of coughing following the second operation under cocaine three days later, and a fatal general peritonitis supervened.

Laparotomy was performed in 10 other cases, the vertical incision at the outer side of the right rectus and the incision following the free costal border being about equally employed.

In 4 of these cases the absence of adhesions low down and the high location of the abscess rendered a secondary resection of the rib advisable. Resection of a rib was done in 3 cases as a primary procedure.

DIAGNOSIS.

In general the points brought out by these cases as an aid to diagnosis were: a liver usually enlarged (especially in single abscess): more commonly upward, usually firm (rarely fluctuating), smooth, not nodular, not hard. Liver area tender, with hypochondriac pain rarely radiating to the shoulder; frequently associated with a lesion of the area drained by the portal system. An irregular temperature, with or without chills, icterus sometimes present, but not found regularly.

Although moral certainty may exist of the presence of the amœbæ, they may not be found in the stools or the expectoration. The characteristic chocolate-brown color of the expectoration, with the presence of liver-cells, may point to an abscess which has ruptured through the lung.

A polymorphonuclear leucocytosis was present in the cases where an enumeration of the white cells was made.

Typhoid fever and malaria were the diseases most frequently suspected when the diagnosis was in question. The elimination of the former was often aided by the inability to demonstrate the specific bacillus in the stools and by the absence of Widal's reaction, the latter by the absence of the plasmodium in the blood and by the resistance of the symptoms to the administration of quinine. It may also be noted that a leucocytosis in an uncomplicated malarial or typhoid fever occurs very rarely, if ever.*

In certain cases aspiration may be resorted to, but only when one is ready to perform a radical operation for the relief of the condition or in the course of operation after the exposure of the liver to locate more accurately the suppurating focus.

POST-MORTEM EXAMINATIONS.

Autopsies were obtained in 20 instances, that is, in all but 5 of the patients who died. Of these, 13 were found to have a single abscess, adding to these the 3 patients who recovered (all presumably of single abscess), there was a total of 16 single abscesses against 10 cases which had more than one abscess and 2 which were undetermined. The size of the abscesses varied greatly, that of the single abscess being as a rule large and of multiple abscesses small. The largest single abscess involved the whole much-enlarged right lobe of the liver, the smallest single abscess was three-quarters of an inch in diameter.

In 18 cases the suppurative process was situated in the right lobe, more frequently in the upper part. In this region the diaphragm was usually adherent, often infiltrated, and in 4 cases was perforated † and frequently there was an associated empyema of the right side, all showing, as has been frequently stated, ‡ that it is in this direction that nature usually attempts a cure by evacuation.

For the privilege of reporting these cases I am indebted to the members of the Medical Board in whose service they have occurred, and particularly to Dr. McCosh, who instituted the compilation and has aided me with many valuable suggestions.

* R. C. Cabot: Clinical Examination of the Blood, 1897.

† Councilman and Lafleur: Johns Hopkins Hospital Reports, 1890–1891. Art. "Amœbic Dysentery."

‡ Winsor: Lancet, December 4, 1897.

XVI.

STATISTICS OF ONE HUNDRED CASES OF CANCER OF THE BREAST AND THE RESULTS OF OPERATION.

By Clarence A. McWilliams, M.D.

The frequency of this disease warrants most careful attention and study, and the early recognition and diagnosis of the condition present are all the more important in the light of the fact that eighty per cent. (according to Billroth, eighty-five per cent.) of all neoplasms of the breast are carcinomatous, and that a cure can be hoped for only when the operation is performed in its incipiency. In the following table an attempt has been made to collect the principal points in the histories of the cases of cancer of the breast occurring in the Presbyterian Hospital from January, 1889, to April, 1899. One hundred cases have thus been tabulated, and the following points elicited :

Etiology.—Marriage, child-bearing, nursing or not, and disorders of menstruation have not been proved to have exerted a causative influence. The disease occurs in all social conditions, and persons in perfect health are attacked as often, if not oftener, than those in poor health. In our statistics only two cases had any hereditary taint. None of our cases developed in pregnancy or lactation, and it is an old saying that a tumor which makes its appearance during either of these periods is almost certainly not cancer. An antecedent suppurative mastitis was present in only three cases.

Trauma.—The significance of an antecedent trauma is still under considerable dispute. The situation of the breasts renders them exposed to various forms of injuries, and almost every woman when asked is able to think of numerous times when she has received injuries of greater or less degree to one or both breasts. In our list there is a record on this point in 65 of the patients, of which num-

ONE HUNDRED CASES OF CANCER OF THE BREAST.

Case Number, Name, and Age	Married or Single	Children	Date of Operation	Duration.	Trauma.	Pain	Removal Nipple.	Location.	Axillary Glands Enlarged or Palpable.	Microscopical Examination.	Cachexia	Operator	Extent of Operation.	Days in Hospital after Operation.	Result.	Recurrence.
1, Mrs. H., 52	Married	Four	March 28, 1895	12 months	None.	None.	Not given.	Right	No.	Breast cancer, glands normal.	No.	Dr. McCosh.	Breast, glands, pectoralis major	16	Recovered	No sign of any recurrence: some weakness in arm: general health excellent.
2, J. F., 41	Married	2	March 28, 1895	12 months	None.	None.	No.	Left	No.	Duct cancer	Yes.	Dr. McCosh.	Breast, axillary glands, both muscles	16	Recovered	No sign of any recurrence: general health fair.
3, M. F., 46	Married	8	October 5, 1895	6 months.	None.	None.	Not.	Right inner.	None.	Scirrhus cancer	None.	Dr. McCosh.	Breast, axillary glands, pectoralis major and part of muscle	17	Recovered	Recurred in upper part of scar three months after operation; secondary operation in June, 1896; died August 31, 1896.
4, M. R., 30	Married	None.	November 27, 1895	15 months	None.	Slight	None.	Right above outer	None.	Cancer, breast and axilla	None.	Dr. Bruce	Breast, axillary glands, pectoralis major and whole of inner	17	Recovered	Recurred in fifteen months in opposite breast, then in sternum and kidney: died July 13, 1898.
5, M. W., 69	Married	None.	January 6, 1898	12 months	Not given.	Slight.	Not	Right above outer	None.	Scirrhus cancer in breast and axillary glands	None.	Dr. McCosh.	Breast and parts of muscle and entire axillary glands	16	Recovered	Perfectly well; no sign of any recurrence anywhere.
6, M. F., 50	Married	8	March 2, 1898	10 months	Not given	Slight.	Yes.	Left outer	None.	Cancer of breast, glands normal	None.	Dr. Bruce	Breast, axillary glands, and both pectorals	17	Died, pneumonia set in three days after operation.	
7, V. H., 46	Married	4	March 28, 1898	9 days	None.	None.	None.	Right	None.	Cancer	None.	Dr. Bruce	Breast, axillary glands, and both pectorals	19	Recovered	Recurred in scar six months after first operation; second operation October 27, 1898: recurrence thoroughly excised; recurred in scar two months after this operation; third operation December 30, 1898: cutaneous nævus had invaded the ribs; recurred in scar in thirty days after operation; died July 21, 1899.
8, M. B., 55	Married	5	April 4, 1898	6 months	None.	None.	Yes	Right upper outer	Yes.	Cancer of breast and glands	None	Dr. McCosh.	Breast, axillary glands, and both pectorals	9	Recovered	
9, M. K., 69	Married	None	March 31, 1898	6 months	None.	None.	Yes	Left center	None.	Cancer of breast and glands	None	Dr. McCosh.	Breast, axillary glands, and both pectorals	21	Recovered	Died November 24, 1899; recurrence in left lung twelve months after operation, also recurrence in nose.
10, A. S., 55	Married	None.	April 4, 1898	12 months	None.	None.	No.	Center	None.	Cancer	None.	Dr. McCosh.	Breast, axillary glands, and both pectorals	16	Recovered	In perfect health, no sign of any recurrence anywhere; slight stiffness in arm.
11, A. B., 52	Married	2	March 28, 1898	12 months	None.	None.	None.	Right	No.	Cancer of breast and glands	None.	Dr. McCosh.	Breast, axillary glands, pectoralis major	16	Recovered	No sign of any recurrence, perfect use of arm; general health fair.
12, S. M., 37	Single	None.	May 20, 1898	6 months	Yes, distinct.	None.	No.	Left upper outer	No.	Cancer	No.	Dr. McCosh.	Breast, axillary glands, pectoralis major	17	Recovered	No sign of recurrence, neuralgic pains and weakness in left arm.
13, M. H., 47	Married	4	June 1, 1898	6 months	No	Yes	Not given	Right	No.	Cancer of breast and glands, which are also tubercular	No.	Dr. Bruce	Breast, gland, both muscles	14	Recovered	
14, C. L., 63	Married	4	May 22, 1898	1	None.	None.	Yes	Left lower inner	Slightly.	Cancer	None.	Dr. McCosh.	Breast, glands, both muscles	28	Recovered	Recurrence in scar fourteen months after operation, still alive.
15, H. C., 49	Single	None.	June 6, 1898	4 months	None.	None.	None.	Right	None.	Cancer of breast and glands	None	Dr. Hutchison.	Breast, glands, both muscles	16	Recovered	No recurrence for thirteen months, then in scar and intercostal spaces: still alive
16, M. C., 42	Single	None.	June 20, 1898	4 months	None.	Yes.	Yes.	Right upper	None.	Cancer of breast and glands	None	Dr. McCosh.	Breast, glands, pectoralis major	9	Recovered	
17, M. E., 48	Married	Not given	June 28, 1898	3 months	Not given.	Yes	No.	Left	Yes.	Tumor (fibrous) breast, cancer of glands	None	Dr. McCosh.	Breast, glands, pectoralis major	10	Recovered	Recurrence in scar twelve months after operation; still alive.
18, H. B., 52	Married	3	July 1, 1898	12 months	Yes.	Yes.	Yes.	Left upper outer.	No.	Cancer of breast and axilla	No	Dr. Brown	Breast, glands, both muscles	14	Died in four hours after operation from shock	
19, M. S., 63	Married	Not given	July 13, 1898	12 months	Yes.	Yes.	Yes.	Left	None.	Cancer of breast and axilla	No	Dr. Brown.	Breast, glands, pectoralis major	16	Recovered	In perfect health: no sign of recurrence anywhere: lower arm disability in arm
20, M. W., 50	Single	None.	July 20, 1898	12 months	Yes.	No.	Not given.	Left upper inner	Yes	Cancer	No	Dr. Flint.	Breast, glands, both muscles	10	Recovered	
21, R. M., 47	Married	3	September 1, 1898	8 months	Yes.	Yes.	Not given.	Left	Yes.	Fibro-glandular cancer	Yes.	Dr. Kidd.	Breast, glands, both muscles	14	Recovered	No sign of any recurrence; general health excellent; slight redness of arm.
22, K. W., 62	Married	Not given	October 20, 1898	12 months	Yes.	No	No	Right	None	Cancer of breast and gland	Yes	Dr. McCosh.	Breast, gland, both muscles	11	Died on eleventh day after operation from pneumonia; developed three days after operation	
23, H. F., 59	Married	Not given	October 12, 1898	12 months	None.	None.	Yes.	Right upper	Yes.	Cancer of breast and glands	No	Dr. Bruce	Breast, glands, both muscles	890	Recovered	Perfectly well; no sign of any recurrence; good use of arm.
24, C. S., 51	Married	3	October 15, 1898	9 months	None.	None.	Slight.	Left	No.	Cancer of breast and glands	No	Dr. McCosh.	Breast, glands, pectoralis major	16	Recovered	No recurrence in scar or axilla, slight redness of arm, perfect use of arm.
25, M. T., 35	Single	None.	October 25, 1898	7 months	None	Slight	Yes	Left	No.	Cancer to both	No	Dr. McCosh.	Breast, glands, both muscles	16	Recovered	Recurred in three months in scar; died March 28, 1899.
26, M. P., 42	Married	3	November 17, 1898	9 months	Old mistress	Slight	Yes	Left	No.	Cancer of glands and breast	No	Dr. McCosh.	Breast, glands, both muscles	10	Died February 18, 1899, of pulmonary oedema due to cachexia in lung of a week's duration.	
27, M. C., 58	Single	Nurse	January 5, 1899	6 months	None.	No	No.	Right above	Yes.	Cancer of breast, glands normal	No	Dr. McCosh.	Breast, glands, pectoralis major	18	Recovered	Perfectly well, perfect use of arm; no sign of any recurrence.
28, C. C., 60	Single	Nurse	December 21, 1898	6 months	None.	No.	No.	Right	No.	Cancer of breast and glands	No	Dr. McCosh.	Breast, glands, both muscles	13	Recovered	No sign of any return; health excellent; some stiffness and disability in arm.
29, B. B., 50	Married	None.	March 8, 1899	1 months	None.	No.	No.	Right	No.	Cancer in both	No	Dr. McCosh.	Breast, glands, both muscles	12	Recovered	In perfect health, slight disability in arm; no sign of recurrence anywhere.
30, F. K., 48	Married	Not given	January 10, 1899	6 months	Yes.	Not given.	Left	Left	Yes.	Cancer in both	Slight.	Dr. McCosh.	Breast, glands, both muscles	67	Died ten days after operation; pneumonia set in; due to cancer of brain.	
31, J. M., 31	Single	None.	December 1, 1898	5 months.	Yes	No	No.	Left outer upper	No	Cancer of tumor, glands not involved	No.	Dr. McWilliams	Both pectorals and axilla	14	Recovered	In perfect health; slight disability in arm; no sign of recurrence anywhere.
32, H. F., 42	Single	None	November 15, 1898	12 months	Yes.	No	No.	Right inner	No.	Cancer of tumor, glands involved	No	Dr. Bruce	Both pectorals and axilla	17	Recovered	Recurred in scar ten months after operation; died October 22, 1899.
33, A. B., 31	Married	No given.	September 15, 1898	6 months	Not given.	Yes.	Not given.	Left inner upper	No.	Cancer of tumor, glands normal	No.	Dr. Bruce	Both pectorals and axilla	16	Recovered	
34, E., 32	Married	None.	July 1, 1898	4 months	Yes.	Not given	Yes.	Left outer upper	No.	Cancer of tumor and axillary glands involved	No.	Dr. McCosh.	Pectoralis major and axilla	16	Recovered	
35, A. B., 32	Single	None	July 1, 1898	3 months	Yes.	No.	No.	Left inner	No.	Cancer of tumor and axillary glands involved	No.	Dr. McCosh.	Both pectorals and axilla	17	Recovered	
36, A. B., 42	Married	None	June 19, 1899	12 months	Yes.	Yes.	No.	Left	No.	Scirrhus cancer of breast and glands	No.	Dr. McCosh.	Both pectorals and axilla	16	Recovered	
37, M. H., 44	Married	Not given.	June 25, 1897	6 months	Yes.	No	No	Left	No.	Scirrhus cancer of breast and axillary glands	No.	Dr. Bruce	Both pectorals and axilla	19	Recovered	
38, A. E., 29	Single	None	June 8, 1897	8 months	Yes.	Yes.	No	Left lower outer	Yes.	Scirrhus cancer of breast	No	Dr. McCosh	Pectoralis major and axilla	15	Recovered	Died March 22, 1899, of local recurrence which began fourteen months after operation. Tumor appeared in opposite breast April 1, 1898; secondary operation May 1, 1898; breast, both pectorals and axillary contents removed: at present none on sign of any return in either of the scars, or in either axilla; has perfect use of both arms; general health excellent.
39, C. L., 34	Married	6	June 8, 1897	19 months	No.	No.	No.	Left outer upper	No	Scirrhus cancer of tumor	No.	Dr. McCosh.	Both pectorals and axilla	13	Recovered	Died January 2, 1899, of cancer of brain; was perfectly well for nine months; then began to have severe headaches which increased in severity; the last few months nocturnal headaches and insomnia spasmodic. A muscle before death facial and speech paralysis: no local recurrence.
40, A. B., 37	Married	2	May 21, 1897	14 months	No.	No	Yes	Right lower	No.	Scirrhus cancer of tumor	No.	Dr. McCosh.	Part of pectoralis major and axilla	22	Recovered	Four months after operation recurred in lower part of nose, and two small nodules appeared in opposite breast; died July 29, 1898.
41, M. V., 52	Married	2	May 24, 1897	13 months	No.	No.	Yes	Left	No.	Cancer of tumor and glands	No.	Dr. McCosh.	Both pectorals and axilla	18	Recovered	In excellent health; no sign of recurrence anywhere.
42, A. L., 50	Married	Not given.	April 20, 1897	6 months	No	Yes.	No.	Left outer upper	No.	Cancer of tumor and glands	No.	Dr. McCosh.	Both pectorals and axilla	17	Recovered	Recurred in opposite breast in two months; that unoperated May 20, 1897; patient died July, 1898, of recurrence in lungs.
43, E. S., 61	Married	Not given	April 26, 1897	5 months	Yes.	No.	No.	Left outer upper	Yes.	Scirrhus cancer of tumor and glands	No.	Dr. Briddon.	Both pectorals and axilla	16	Recovered	Died of recurrence in scar and axilla: cutaneous ulcerating mass, oedema of arm reached a gigantic size; died October 20, 1897.
44, C. O., 50	Married	Not given	March 22, 1897	24 (?)	Yes.	Yes.	No.	Left center	No.	Scirrhus cancer of tumor and glands	Yes.	Dr. McCosh.	Both pectorals and axilla	14	Recovered	Perfectly well for ten months after operation, then left arm began to swell; swelling soon appeared in left side of neck and axilla: no recurrence in scar; died June 30, 1898.
45, L., 41	Married	Not given	March 31, 1897	6 months	No.	No.	No.	Left upper inner	No.	Scirrhus cancer of tumor and glands	No.	Dr. Briddon	Both pectorals and axilla	15	Recovered	Died of metastasis in opposite lung April 14, 1898. Perfectly well for eleven months, no local recurrence.
46, A. E., 42	Single	None.	March 3, 1897	12 months	No.	No.	No.	Left upper inner	No.	Scirrhus cancer of tumor and glands	No.	Dr. Briddon	Both pectorals and axilla	31	Recovered	
47, J. P., 44	Married	None	February 26, 1897	7 months	No	Yes.	No.	Right inner	Yes	Scirrhus cancer of tumor and glands	Yes.	Dr. McCosh	Pectoralis major and axilla	22	Recovered	No recurrence in scar or axilla; one year ago a small lump, size of a pea, appeared above left clavicle: this has very gradually increased in size and is now large as a hickory nut, and two other small nodules have appeared, one axillæ in the fossa. Considerable œdema of left arm has been present for six months and seems to be getting worse. Seven months after operation a lump appeared in scar which was removed: at first secretion there but small nodules been removed from scar. Examination at Pathological Institute has always been negative. Nodules in line of scar same as axilla; general health fair
48, F. S., 62	Married	Not given	April 16, 1897	12 months	Not given.	Not given.	Not given	Left	No.	Cancer of tumor and glands	No.	Dr. McCosh.	Both pectorals and axilla	17	Recovered	Died November 19, 1897. Recurrence in pleura twelve months after operation.
49, M. F., 50	Married	None	June 10, 1896	1 year	Not given.	No.	No.	Left	No.	Scirrhus cancer, glands normal	No.	Dr. McBurney.	Both pectorals and axilla	17	Recovered	Died September 30, 1898. Well for one month, when she began to cough and to experience offensive sputum; breathing became labored; no local recurrence; cause of metastasis in lung.
50, M. D., 63	Married	None	June 12, 1896	2 years	Not given.	No.	No.	Left	No.	Scirrhus cancer, glands normal	No.	Dr. McBurney.	Both pectorals and axilla	19	Recovered	Died April 5, 1899, of cancerous tumor of brain. Perfectly well for two years and six months, when tumor appeared same as seen in article above.
51, R. Mcl., 39	Married	3	June 15, 1896	7 months	Not given.	Yes.	Not given.	Left outer lower	No.	Scirrhus cancer of tumor and glands	No.	Dr. Elsts...	Both pectorals and axilla	19	Recovered	Perfectly well now; general health ever better: no sign of any recurrence anywhere; perfect use of arm.
52, E. T., 51	Married	None	May 11, 1896	12 months	Not given.	Not given.	Not given	Left centre	Yes.	Scirrhus cancer of tumor and glands	Yes.	Dr. Briddon.	Both pectorals and axilla	30	Recovered	Died March 29, 1898, of metastatic cancer of the stomach of three months' duration; perfectly well for eighteen months.
53, E. T., 42	Single	None	May 11, 1896	3 months	Yes.	Yes.	Not given	Right upper	No.	Cancer of tumor and glands	No.	Dr. McCosh.	Pectoralis major and inner and outer and axilla	37	Recovered	
54, Mrs. D., 63	Married	Not given	January 25, 1896	12 months	Not given.	No.	Yes.	Right centre	No.	Cancer of tumor and glands	No.	Dr. McCosh.	Pectoralis major and axilla	15	Recovered	No disability nor œdema of arm after operation: general health fair., no sign of any recurrence at present date or scar or axilla or opposite breast.
55, J. M., 50	Married	6	January 29, 1896	8 months	Yes.	Yes.	Yes.	Left outer	Yes.	Scirrhus cancer of breast and glands	No.	Dr. McCosh	Major and part of minor and axilla	19	Recovered	Perfectly well: no sign of any recurrence anywhere; slight stiffness in arm for six months: has perfect use of it now.
56, E. S., 50	Single	None	February 8, 1896	6 months	Yes.	Yes.	Yes.	Left outer	Yes.	Scirrhus cancer of breast and glands	No.	Dr. McCosh.	Both muscles and axilla	21	Recovered	
57, Mrs. W., 50	Single	None	September 7, 1895	5 months	No.	No.	No.	Right	No.	Scirrhus cancer of breast and glands	No.	Dr. McCosh.	Both muscles and axilla	30	Died, complicating meningitis and nephritis.	
58, S. R., 42	Married	3	August 13, 1895	18 months	Not given.	Slight.	Not given.	Left lower outer	Yes.	Scirrhus cancer of breast and glands	No.	Dr. McCosh.	Both muscles and axilla	20	Died, complicating cancerous deposits in lung and endocarditis.	
59, J. R., 60	Married	Not given	June 18, 1895	3 years (?)	Yes.	Not given.	Right outer	No.	Cancer of breast, glands normal	No.	Dr. McCosh.	Both muscles and axilla	9	Recovered.		
60, Mrs. T., 30	Married	Not given	June 18, 1895	3 months	Yes.	Not given.	Right outer	No.	Cancer of breast, glands normal	No.	Dr. McCosh.	Both muscles and axilla	9	2 mos.	Died, sepsis.	
61, K. C., 37	Single	Not given	June 13, 1895	3 months	Not given.	No	Not given.	Left outer	No.	Cancer of breast, glands normal	No.	Dr. McCosh.	Both muscles and axilla	11	Recovered	
62, L. L., 51	Married	None.	June 20, 1895	12 months	Not given.	Yes.	Not given.	Left lower	Yes.	Cancer of breast and glands	No.	Dr. Elsts	Both muscles and axilla	16	Recovered	In perfect health; no sign of any recurrence.
63, S. W., 42	Married	Not given.	June 29, 1895	3 years	Not given.	Yes.	Not given.	Right upper outer	Yes.	Cancer of breast and glands	No.	Dr. Elsts	Both muscles and axilla	20	Recovered	Recurred so long one year and a half after operation, and then fixed six months after metastasis first gave symptoms of shortness of breath and attacks of suffocation: died March 6, 1897.
64, M. F., 40	Married	3	July 9, 1895	12 months	Not given.	Yes	Right	Yes.	Cancer of breast and glands	No.	Dr. Brown	Breast only	16	Recovered	Died November 9, 1895, of metastasis of liver appearing six months after operation.
65, M. P., 42	Single	None	July 13, 1895	3 months	Yes.	Yes.	Not given.	Right	No.	Cancer of breast and glands	No.	Dr. Brown	Breast and axilla	18	Recovered	Died September 8, 1895, of cancer of left breast, which appeared six months after operation.
66, H. A., 63	Married	4	July 20, 1895	6 months	No	Yes.	No.	Right upper outer	Yes.	Cancer of breast and axilla	No.	Dr. McCosh.	Both pectorals and axilla	39	Recovered	Died September 8, 1895, of cancer of liver, which appeared six months after operation.
67, J. G., 40	Single	None	March 1, 1895	6 months	No.	No.	No.	Right under	Yes.	Cancer of breast, glands normal	No.	Dr. McBurney	Pectoralis major and axilla	11	Recovered	Died September 8, 1895, never fully recovered from the operation
68, J. S., 56	Married	3	November 1, 1894	8 months	No.	No.	No.	Left lower	Yes.	Scirrhus cancer of breast and glands	No.	Dr. McBurney	Pectoralis major and axilla	30	Recovered	Perfectly well; general health fair; no sign of recurrence anywhere; perfect use of arm.
69, M. S., 48	Married	3	November 1, 1894	8 months	No.	No.	No.	Right	Yes.	Scirrhus cancer of breast and glands	No.	Dr. McBurney	Both pectorals and axilla	24	Recovered	
70, E. S., 50	Single	None	May 31, 1894	12 months	No.	No.	No.	Right under	No.	Cancer of breast, glands involved	No.	Dr. Elsts	Both pectorals and axilla	12	Recovered	
71, M. A., 42	Married	3	May 31, 1894	12 months	No.	No.	No.	Left lower	Yes.	Scirrhus cancer of breast and glands	No.	Dr. McCosh.	Part of both pectorals and axilla	20	Recovered	
72, M. M., 42	Married	3	May 31, 1894	12 months	No.	No.	No.	Left lower	Yes.	Scirrhus cancer of breast and glands	No.	Dr. Briddon	Pectoralis major and axilla	30	Recovered	
73, A. A., 60	Single	None.	March 1, 1894	6 months	No.	Yes.	Yes.	Right outer	Yes.	Scirrhus cancer of breast and glands	No.	Dr. Briddon	Pectoralis major and axilla	13	Recovered	No sign of recurrence anywhere; better health for past four years than it had been for a good many years before the operation.
74, M. W., 50	Married	4	March 21, 1894	3 months	Not given.	No.	No.	Right	Yes.	Scirrhus cancer of breast and glands	No.	Dr. Briddon	Breast, and axilla, no muscle	9	Recovered	No sign of recurrence anywhere; perfect use of arm. In hospital May, 1899, for pleurisy with effusion when 3/4 of dead drawn off. lungs are now perfectly clear.
75, M. S., 42	Single	None	September 20, 1893	3 months	No	Yes	Not given	Right	No.	Cancer of breast and glands	No.	Dr. Briddon	Breast and axilla, no muscle	9	Recovered	No sign of recurrence anywhere; health never better at present time.
76, M. K., 48	Single	None	September 6, 1893	7 months	No	Yes	Not given	Right upper outer	Yes.	Cancer of breast and glands	No.	Dr. Briddon	Part of pectoralis major, no muscle	11	Recovered	No evidence of recurrence anywhere: arm was disabled for six months, but now almost perfect use.
77, M. N., 37	Married	Not given.	June 28, 1893	19 months	Yes.	Yes.	Not given.	Right	Yes.	Cancer of breast and glands	No.	Dr. Schultze	Breast and axilla, no muscle	21	Recovered	Died in Cancer Hospital July 2, 1895, of recurrence in scar, which first appeared sixteen months after operation.
78, M. S., 50	Single	None	June 28, 1893	12 months	No.	No.	Yes.	Right	Yes.	Cancer of breast and glands	No.	Dr. McCosh.	Pectoralis major and axilla	17	Recovered	
79, M. W., 50	Married	3	June 22, 1893	10 months	No.	No.	Not given	Right outer	Yes.	Scirrhus cancer of breast and glands	No.	Dr. McCosh.	Breast and axilla, no muscle	18	Recovered	
80, F. J., 52	Married	None.	May 22, 1893	12 months	No.	No.	Not given	Right outer	Not given	Cancer of breast and glands	No.	Dr. Bruce	Breast and axilla, no muscle	19	Recovered	
81, L. B., 53	Married	None.	December 8, 1892	7 months	No.	No	Yes	Left outer	No.	Cancer of breast	Slight	Dr. Briddon	Breast and axilla, no muscle	13	Recovered	No sign of recurrence anywhere; died October, 1896, of acute lobar pneumonia.
82, M. McG., 61	Married	None.	November 30, 1892	4 years	Not given	No.	Not given	Left inner	No.	Cancer	No.	Dr. McCosh.	Breast and axilla, no muscle	No record	Recovered	
83, S. W., 60	Single	None.	January 25, 1892	2 years	No.	No.	Not given.	Right outer upper	No.	Cancer of breast and glands	No.	Dr. McCosh.	Breast and axilla, no muscle	15	Recovered	
84, S. G., 46	Married	None.	December 1, 1892	18 months	Yes.	Yes.	No.	Right	No.	Cancer of breast and glands	No.	Dr. Bruce	Part of major and axilla	18	Recovered	
85, M. T., 34	Married	None.	December 29, 1892	12 months	Yes.	Yes.	No.	Left upper outer	No.	Cancer of breast and glands	No.	Dr. McCosh.	Breast and axilla, no muscle	16	Recovered	
86, T., 31	Married	2	July 25, 1892	6 months	Yes.	Not given.	Yes.	Left upper outer	No.	Cancer	No.	Dr. Briddon	Breast and axilla, no muscle	20	Recovered	
87, M., 55	Married	2	May 21, 1892	2 years	Yes.	Yes.	Yes.	Left	No.	Cancer of breast	No.	Dr. Briddon	Breast and axilla, no muscle	38	Recovered	No sign of any recurrence anywhere; general health good.
88, A. M., 51	Married	Not given.	June 28, 1892	5 months	Not given.	No.	Not given.	Left upper inner	No.	Cancer of breast and glands	No.	Dr. McCosh.	Breast and axilla, no muscle	19	Recovered	
89, M. F., 53	Married	None.	October 31, 1889	12 months	Not given.	Yes.	Not given.	Right upper outer	No.	Cancer of breast and glands	No.	Dr. Bruce	Breast and axilla, no muscle	40	Recovered	Has been in perfect health since the operation: no sign of any recurrence; has perfect use of arm
90, L. T., 63	Married	None	September 21, 1889	10 months	No.	Yes.	Not given.	Right upper inner	No.		No.	Dr. Briddon	Breast and axilla, no muscle	17	Recovered	Died in eight months of local recurrence.
91, M. F., 48	Married	None.	May 11, 1889	5 weeks	Not given.	No.	No.	Left	Yes.	Cancer of breast	No.	Dr. McCosh	Breast and axilla, no muscle	12	Recovered	
92, F. C., 42	Married	None.	February 9, 1889	16 months	No.	No.	Not given.	Left upper outer	Yes.	Cancer of breast	No.	Dr. Bruce	Breast and axilla, no muscle	15	Recovered	Perfectly well now; no sign of any recurrence: lack of power in arm for one year after operation, but since no inconvenience whatever; has just passed seventy-fourth birthday.
100, C. McP., 60	Married	Not given.	January 24, 1882	8 years	Not given.	No.	Not given.	Left upper outer	Yes.	Cancer of breast	Yes.	Dr. McCosh.	Breast and axilla, no muscle	15	Recovered	Perfectly well for six months after operation when recurred in scar and patient died of exhaustion. January, 1890.

* On account of skin grafting.

ber 29, or 44.6 per cent., gave the history of a distinct antecedent trauma.

Marriage has been said by some to have a direct influence upon primary cancer of the breast, as high as eighty per cent. being given as occurring among married women. Seventy-four of the patients were married, or seventy-four per cent.

Child-birth.—Forty-eight patients present facts bearing upon this point. Of this number 32, or 66.6 per cent., had borne children, the average number of children to each patient being five.

Accurate details as to nursing can unfortunately not be given, as the histories are very deficient on this point.

Symptoms.—Unfortunately, for the good of womankind, there are no subjective symptoms in the incipiency of cancer of the breast, and the first symptom, in the vast majority of the cases, is the accidental discovery of a hard, not sensitive, painless tumor in the breast, and the absence of pain disarms the patient's suspicions as to its malignancy; consequently the family physician is not consulted. Pain, as a rule, is not at all pronounced till the surface of the tumor has ulcerated, or till enlargement of the axillary glands has occurred, which press upon the branches of the brachial plexus and cause neuralgic pains down the arm. There may be, however, while the tumor is yet small, a sense of discomfort in the breast, amounting at times, particularly during the menses, to a dull ache. Out of 96 cases, 54, or 56.2 per cent., had some local discomfort or ache prior to operation. It is a remarkable fact that cancers of the breast may attain a large size without the slightest twinge of pain. This may be accounted for by the fact that the advancing, invading cancerous tissue paralyzes the nerve-filaments with which it comes in contact. In respect to pain cancer is somewhat distinguished from benign tumors of the breast, the most frequent of which results from chronic mastitis, which is prone to be a painful process.

Retracted nipple depends on the position of the growth, which will not affect the nipple if it be situated on the periphery of the gland. Retraction of the nipple is caused by the pulling in toward the growth of all the tissues in its neighborhood. Of 73 of the cases about which there is information in this regard, 33, or 45.2 per cent., had retraction of the nipple.

Situation.—In 51 of the cases the right breast was involved, and in 49 the left.

Left Breast.
Inner quadrant involved in ten cases.
Outer quadrant involved in nineteen cases.

Right Breast.
Inner quadrant involved in twenty-one cases.
Outer quadrant involved in nine cases.

In the remainder of the cases the tumor was near the centre of the gland. In no case were both breasts primarily involved at once.

Axillary Lymphatic Gland Enlargement.—Out of 98 cases, 48, or 48.9 per cent., had the lymphatic glands in the axilla palpably enlarged. It is imperative in all cases of mammary cancer to remove all the lymph-glands in the axilla, even though they may not be palpably enlarged when the axilla is opened ; for even in this case microscopical examination often reveals a cancerous invasion of the glands. This is clearly shown in our table, in which the axillary glands of 75 cases, after their removal, were examined microscopically. Out of this number the axillary glands in fifty-nine of the cases, or 78.6 per cent., showed distinct cancerous infection. In Case 13 the axillary glands were both cancerous and tuberculous. There seems to be no rule as to how long a time elapses after the tumor has appeared in the breast before the glands become involved. In some cases it is apparently a simultaneous process, while in others a considerable time passes before changes in the axillary glands are appreciated. Hence the absolute necessity for as early an operation as possible after the appearance of the tumor. Naturally the question of prognosis depends largely on whether the axillary glands are invaded or not. Should we not go still farther in our operation and remove the supraclavicular glands? This Halsted, of Baltimore, urgently insists upon. He excises both the axillary and supraclavicular glands in all his cases, and says the additional time occupied in removing these glands adds nothing to the mortality of the operation. He has cleaned out the supraclavicular fossa in 67 cases and cancer was found in the tissues removed 23 times, or 34.3 per cent.

Cachexia.—This was not a very prominent symptom in our cases and is not apt to develop early. Fourteen cases only showed any cachexia, and these to only so slight a degree as not to contra-indicate operation.

Age.—The average age was forty-nine years, six months, and twenty-six days, distributed as follows :

Between 25 and 30 years	1 case.
" 30 " 35 "	9 cases.
" 35 " 40 years	9 "
" 40 " 45 "	18 "
" 45 " 50 "	12 "
" 50 " 55 "	10 "
" 55 " 60 "	16 "
" 60 " 65 "	15 "
" 65 " 70 "	5 "
" 70 " 75 "	3 "

The youngest patient was Case 38, who was twenty-nine years of age; and the oldest was Case 1, who was seventy-two years of age.

Operation.—The incisions were made so as not only to remove the infected skin overlying the tumor, but to get so far into healthy skin as to endeavor to avoid any possibility of cancerous infection. The necessity for this is evident when we consider that recurrence most often takes place in the skin around the scar or in the scar itself, and in observing these cases I am led to believe that not enough skin has been habitually removed. The desire to approximate the skin edges should not be allowed to interfere with the liberal excision of skin, as this is of very minor importance when compared to the necessity for a total extirpation of the growth. The dissection is then begun in the axilla and the incision carried down to the pectoralis major tendon, under which, when exposed, the finger is passed and the tendon divided near its insertion upon the finger. The axilla is then laid open by dividing the fascia beneath the great pectoral, and the axillary vein is clearly identified, the situation of which should never be lost sight of as it is the guide to the whole space. The pectoralis minor muscle is now exposed and its tendon divided and reflected back toward the chest with the entire mass. The removal of the pectoralis minor gives much easier access to the very apex of the axilla, and hence greater certainty of removing infected glands, and as the removal of this muscle makes practically no difference in the function of the arm afterward, it should always be removed. The axillary contents, consisting of fat and glands, are dissected back from the apex of the axilla toward the breast. This is a better method of procedure than to proceed from breast to axilla in the dissection, in which case we are more likely to press into the general lymphatic system cancerous cells. The breast, muscles, and axillary contents should all be removed in one piece,

since cancerous tissues should never be cut into, nor across, nor removed piecemeal for fear of spreading infection. The subscapular nerves are preserved, if possible, although, if imbedded in a mass of enlarged glands, they are removed. The whole mass is then cut away from the chest. This operation seems to be a mutilating one, but the after-results are surprising. One would expect considerable disability after the removal of so much muscle, but such is not the case. The patients may complain a few months of stiffness and weakness in the arm, but the arm regains its former strength. The functions are maintained by the anterior fibres of the deltoid and the clavicular portion of the pectoralis major. Should the axillary vein be found to be imbedded in a mass of enlarged glands, a portion of it is divided between ligatures. In this case more or less permanent œdema of the arm may be expected. A drainage-tube is generally left in the bottom of the wound for thirty-six or forty-eight hours, as there is generally some oozing. The edges of the wound are brought together as closely as possible by sutures throughout the extent of the wound. This is often facilitated by separating the inner skin edge from the chest for two inches back, which allows this edge to be drawn farther externally. Any defect between the skin edges is allowed to granulate, or if considerable is grafted at the time of the original operation or afterward. Halsted removes so much skin that he is never practically able to approximate the skin edges; to remedy which he always grafts skin at the time of the original operation. After a copious dressing has been applied, the arm is bound to the side by a roller bandage, the forearm and hand being allowed to remain free, which adds much to the comfort of the patient.

Mortality.—It is one of the remarkable facts in surgery that an operation of such apparent magnitude, which is attended by some loss of blood, and which is at times a prolonged one, should be accompanied by such a low death-rate; the few nerves which are cut possibly accounting for the small amount of shock. In the following 100 cases, four deaths, or four per cent., only can be directly traced to the effects of the operation. One patient, Case 85, died three days after operation of suppression of urine; two others, Cases 6 and 22, developed past-operative pneumonia, while Case 18, died four hours after operation from shock. Of the four other cases which died in the hospital, the fatal result can in no sense be attributed to the

operation. Case 61 died at the end of three weeks from presumably secondary cancerous deposits in the mediastinum and lungs, but this occurred a week or more after the patient had been out of bed. Case 60 died on the thirty-first day of nephritis and some secondary cerebral lesion. Case 63, one of the oldest of the series, died at the end of two months of senile changes. Case 30 died of secondary cancer of brain. This gives an operative mortality of four per cent.

Death from sepsis has not occurred. The low mortality-rate leads us to undertake the operation even in cases where we cannot hope to thoroughly eradicate the disease, for the operation will ameliorate the patient's condition and will prolong life. No death is more trying for the patient and the patient's friends than that caused by an ulcerated, sloughing cancer of the breast, and metastasis of an internal organ is infinitely to be preferred as a cause of death. Mortality statistics of others are: Bull, 3.6 per cent.; Curtis, six per cent.; Weir and Dennis, no deaths in a reported series of 125 and 33 cases respectively.

The average length of stay of each patient in the hospital was twenty days. The patients are encouraged to sit up in bed as soon as possible after the operation, generally about the fourth day, and to get out of bed about the seventh day, sometimes even as early as the fifth day. Convalescence is consequently very rapid. Movement is allowed at elbow on the second day after operation and from the shoulder after the tenth day; massage at the end of a week is given to the muscles of arm and shoulder.

Recurrence.—We now come to the most interesting part of our report, and we shall endeavor to ascertain how much good has been done these patients, and what can be said as to prognosis after operation. To accomplish this an endeavor has been made to get news of each patient in the list; to see personally the ones who are alive, and to get accurate information, when possible, from the physician in attendance, regarding the cause of death in the fatal cases. Of the 92 patients who went out of the hospital, statistics have thus been obtained of 66. No trace has been found of 26, the reason for which can easily be appreciated when we consider the difficulties in the way of tracing patients belonging to the class which we find in the average hospital ward. These statistics were all obtained on or about December 1, 1899.

Number of Cases free from Recurrence at Yearly Periods from Operation.

		Per Cent.
At end of 1 year	36 cases out of 61,	or 59.1.
" " 2 years	19 " " 52,	" 36.6.
" " 3 "	17 " " 50,	" 34.0.
" " 4 "	13 " " 46,	" 28.2.
" " 5 "	9 " " 43,	" 20.9.
" " 9 "	3 " " 37,	" 8.1.
" " 10 "	1 " " 35,	" 2.8.

If we adopt three years of immunity from recurrence as the limit of time when we can say a patient is cured, 17, or thirty-four per cent., of the patients were cured.

Halsted, of Baltimore, published, in 1898, his statistics on cancer of the breast, giving forty-one per cent. of cures after three years. Other results of cures after three years are as follows, all published in 1894:

	Per Cent.
Bergmann	30.2
Billroth	4.7
Gusselbauer	16.7
König	22.5
Volkmann	14.0
Bull	26.6
Curtis	20.7
Weir	20.0
Dennis	25.0

Table of Recurrence.

Recurrence has taken place within 3 months in 4 cases.
Between 3 and 6 months in 7 cases.
" 6 " 9 " " 3 "
" 9 " 12 " " 7 "
" 12 " 18 " " 6 "
At 1 year " 10 " " 1 case.
" 2 years " 6 " " 1 "
" 4 " " 2 " " 1 "

Four patients died of recurrent cancer, in whom the time of recurrence was not ascertainable:

One at 2 years	Case 73
" 2 months	Case 68
" 3 "	Case 26
" 6 "	Case 42

It is, therefore, clear from these tables that all the recurrences took place within two years of the operation, except in two patients, one of whom (Case 67) died four years and three months after operation of cancer of the lung. Shall we call this a recurrence after four years, or is it not truly a case of re-infection, in which the original disease had no influence? The second patient (Case 53) died two years and six months after operation from cancer of brain. Twenty-one cases recurred in the first year, and twenty-eight within two years. There are some interesting statistics concerning the location of the recurrences:

Recurrence—local,	in scar or skin about scar,			in 15	cases.
"	"	"	lung	" 6	"
"	"	"	opposite breast	" 3	"
"	"	"	liver	" 2	"
"	"	"	brain	" 2	"
"	"	"	supraclavicular glands	" 2	"
"	"	"	stomach	" 1	case.
"	"	"	pleura	" 1	"
"	"		locality unknown	" 2	cases.

The clinical history subsequent to operation of several of the cases is interesting.

Case 17 had a small tumor of breast, of five months' duration, removed July 1, 1897, by Dr. McCosh, which, after careful pathological examination, was found to be chronic inflammation. Eleven months afterward another tumor appeared in the same breast, and this time a radical operation was performed, the breast, pectoralis major, and axillary contents being removed. Pathological examination of the breast tumor revealed "Chronic inflammation, with much proliferation of cells," while the axillary glands showed carcinomatous infection. Twelve months later, metastasis took place in liver. The patient is still alive, but very ill.

How are we to explain this case? How much influence had the chronic mammary inflammation to do with the axillary cancer?

Case 37 had one breast removed by a radical operation for cancer, June 23, 1897. Without any local recurrence, a tumor appeared in the opposite breast April 1, 1898. Radical operation was performed in April, 1898, and the tumor and axillary glands pronounced to be cancerous. No recurrence was discoverable December 1, 1899, two years and five months after the first operation, and one

year and eight months after the second. The patient has perfect use of both arms, and works for her living.

Case 53 was exceedingly interesting. For notes on this case I am indebted to Dr. Stillwell. The breast was removed radically June 23, 1896. The patient was well for two years and six months, when, in December, 1898, she began to complain of difficulty in expressing herself, and dulness of mind. Three months later, March 9, 1899, she developed some loss of muscular power in the right arm, difficulty in concentrating the mind, and slowness of speech. Was also emotional. Had no headaches. March 17, right arm showed marked loss of muscular power. Pulse absolutely normal; also kidneys and lungs. Sensation normal in right arm. Cerebration was sluggish; did not confuse words. No headache, no vomiting. March 28 had a severe chill, and during day had three fainting attacks, in which pupils were contracted but equal, was semi-conscious, and total paralysis of right arm and leg developed. March 29, after use of powerful cathartics, intelligence cleared up, paralysis became much better, *i.e.*, had slight movements in arm and leg (alleviation of symptoms possibly being due to the relief of cerebral œdema). March 30, greatly improved, pupils normal, could read intelligently, and talked well. April 2, pulse was 68, no fever. Mind sluggish and drowsy. Speaks correctly when questioned, but in monosyllables. April 3, next day, slight dysphagia developed, moves leg fairly well, but arm not at all. Seems weaker, no vomiting, no headache. April 4, mentally clear. Can move arm slightly. April 5, moves arm slightly, clear mentally up to end, no vomiting nor headache at any time. Pulse, 120, action weak and heart bad; breathing became labored, and died suddenly April 5. Autopsy showed that the two vertebral arteries were not obliterated, only slight general atheroma. Left anterior and middle lobe centrally softened, so that section was impossible; and under the convolutions and in centre of this soft mass, was a hard, sharply defined mass, the size of a small egg. Microscopical examination showed this to be medullary cancer.

Case 38 died eighteen months after operation of metastatic cancer of brain. She was well for nine months, when she began to complain of headaches, which were intractable. Four months later the headaches became agonizing, particularly at night, and rendered sleep impossible. Left-sided facial paralysis developed two

months before death, and paralyses of speech two weeks before death.

Death has taken place in the recurrent cases on an average one year, two months, and twenty days after the operation. The average length of time after recurrence set in till death took place, has been five months.

In concluding the subject of recurrence, and considering the facts before us, we are, unfortunately, obliged to confess that we can never promise to absolutely cure a patient with cancer of the breast by operation. If the case is seen while the tumor is yet small, and there is no axillary gland involvement, we can tell the patient's friends that a cure is very possible, but not by any means certain. We know we can cure a certain number; but our knowledge is not as yet deep enough to select from a given number of cases those which will not have a recurrence, and those which will recur. Thirty-four per cent. of these cases, we have seen, were cured (*i.e.*, passed the three-year limit without recurrence). This percentage is not absolute, however, because not all the patients operated on over three years ago could be found, consequently we know not whether this percentage would be increased or diminished had we been able to trace them all. The fact remains, however, that at the end of three years, 17 patients were perfectly well, which is a very excellent showing compared with earlier results, and well calculated to convince any who may think the operation of doubtful utility. With recurrence taking place in the scar or its neighborhood in 15 of the cases, it would seem that it has not been the custom to remove enough skin with the breast. Have we sufficient warrant to subject the patients to the additional ordeal of removing the supraclavicular glands, in view of the fact that in only two cases was recurrence primarily in these glands? If the process has gone on so far as to infect these glands, is not a general infection very probable, and will their extirpation be more likely to effect a cure?

In conclusion, I venture to assert that many of the profession feel that this is an operation which is merely palliative. These statistics prove that such a feeling is a false one, and calculated to do immense harm. It is the duty of the profession to impress upon the laity the idea that the smallest nodule in the breast may become a source of the greatest danger to life, and that the only hope of a cure lies in early and radical operation. A summary of the points

elicited in the preceding article, as well as a table of the cases follows:

Summary.

Trauma present in ..... 44.6 per cent. of the cases.
Married ..... 74 per cent. " "
Children born to ..... 66.6 per cent. " "
Average number of children to each ..... 5.
Pain present in ..... 56.2 per cent. of the cases.
Nipple retracted in ..... 45.2 per cent. " "
Right breast involved in ..... 51 cases.
Left " " ..... 49 "
Axillary glands palpable in ..... 48.9 per cent. of the cases.
" " found cancerous by microscope ..... 78.6 per cent. " "
Average age was ..... 49 years, 6 months, 26 days.
Mortality of operation was ..... 4 per cent.
Average length of time in hospital ..... 20 days.
Prolongation of life for one year ..... 59 per cent.
" " " two years ..... 36 per cent.
Cured (no recurrence at end of three years) ..... 34 per cent.
Recurrence took place in one year in ..... 21 cases.
" " in two years in ..... 28 "
" " locally in ..... 15 "
" " in lung in ..... 6 "
Average length of time in recurrent cases from operation to death ..... 1 year, 2 months, 20 days.
Average length of time from period of recurrence to death ..... 5 months.

XVII.

A RAPID METHOD OF FIXING BLOOD-FILMS FOR EHRLICH'S STAIN.

By Fred P. Solley, M.D.,
assistant in the pathological department.

In making blood-examinations for diagnostic purposes it is frequently necessary to return a complete report within the shortest possible time.

The old method of fixing cover-slip films by heat for the purpose of staining the red and white cells is a very slow one for such purposes, and has the additional and serious drawback of affording uncertain results. The most reliable rapid method by heating is that recommended by Cabot in his book on "Clinical Examination of the Blood" (third edition). Cabot places the cover-glasses with their films in a dry-heat sterilizer, in which the temperature is then gradually raised to 150° C., when the heat is turned off and the specimen allowed to cool slowly.

This procedure requires at least one-half hour for completion, demands close watching lest the temperature rise too high or too rapidly, and not infrequently affords poor stains even when every care is exercised in its performance.

Experiments have been made with chemical agents of late in the Pathological Laboratory of the Hospital, with the purpose of shortening this process and insuring more uniform results than seemed possible with the heating method.

A mixture of equal parts of alcohol and ether fixes films very satisfactorily in about twenty minutes, and for studying red cells or malarial organisms affords excellent specimens. The leucocytes, however, are not prepared by this means to take up the triple stain of Ehrlich, so that a differential count of these elements is unsatisfactory or impossible.

Similar difficulties were experienced with hardening agents of

various sorts, such as formalin, bichloride of mercury or Müller's fluid. It was found that solutions which rendered the red cells susceptible of clear staining by the Ehrlich mixture failed to effect the leucocytes, and *vice-versa.* Finally experiments were made by G. A. Tuttle with chromic acid, and after trials of different strengths for varying periods of time he found that a two per cent. solution poured on the film and allowed to remain for exactly thirty seconds gave uniformly good results, both red and white cells taking up their special stains clearly and surely. The nuclei and granules of the leucocytes stain quite as sharply as in the best specimens fixed by heat—while the protoplasm of the mononuclear lymphocytes is usually better stained than by the latter method.

By this method, then, the whole process of preparing the specimens for examination is reduced to five or six minutes, and when the films are evenly and thinly spread, the preparations are certain to be available for accurate differential computation. The red cells occasionally show defects as a result of the action of the acid; but this usually means that the solution has been left on too long, or that the films were unevenly spread. Indeed the spreading of the films is of the utmost importance in securing satisfactory results by any method.

The plan now followed in the laboratory is to use extra thin square cover-glasses, which are cleaned by immersion in strong nitric acid for some hours. They are then transferred to alcohol, which is changed several times. In this they are kept until used. Just before taking the specimens they are dried and polished with a soft cloth. The squares when once cleaned are invariably handled by the edges or corners.

The blood is obtained from the lobe of the ear. A drop the size of a pin-head is taken up on a cover-glass, which is then immediately applied to a second cover so that the blood at once spreads out in a very thin film between them—care being taken that the corners of the squares do not coincide. The cover-glasses are now carefully separated by sliding one over the other in exactly parallel planes, when each will be found covered with an even film which dries very quickly in the air.

The two per cent. chromic-acid solution is next spread from a dropper over the film, the cover-glass being held in a staining forceps. After thirty seconds the acid is thoroughly washed off and

the excess of water removed by tapping a corner of the square on filter-paper. The stain is then poured over the film in the same manner, and washed off quickly after three minutes. The specimen may then be dried between layers of filter-paper and is ready to be mounted in balsam.

By employing this method a complete blood-examination may be carried out in a little over an hour at the bedside of the patient, often affording valuable information in cases where the desirability of surgical intervention is in question.

Dr. Tuttle has also devised a very simple procedure by which films may be fixed at the bedside when chromic-acid solution is not at hand. The spreads are made on heated slides, a temperature of 60° to 70° C. having been found to fix the films so that they will not wash off after staining. The slide is heated over a lamp or gas-jet to a degree tolerable to the skin of the back of the hand, and the blood is immediately smeared on this by means of the rounded edge of a second slide.

These spreads may be stained when dry with Ehrlich's solution, and are perfectly available for a differential leucocyte count. The red cells do not stain by this method, however, and the distinction between the different kinds of leucocytes is not so sharp as in the chromic-acid fixation—but for a rough estimate of the blood condition it might serve a valuable purpose in an emergency in the absence of the fixing solution.

XVIII.

CASES ILLUSTRATING CERTAIN UNUSUAL RESULTS OF CONTUSION.

By Ellsworth Eliot, Jr., M.D.

No injury in the entire field of traumatic surgery presents such a wide range of variability, in respect to the amount and degree of damage inflicted, as that of contusion. In the event of violence directed against the cranial, thoracic, and abdominal cavities, in the absence of fracture of one or other of the bones that form partially or completely the walls of these spaces, the apparent bruising of the overlying soft parts may be accompanied by some serious damage of the inclosed viscera. Rupture of one or other of these organs may take place, or in other instances, when the organs are intact, a smaller or larger blood-vessel may give way, and the blood, escaping, may so completely fill a serous cavity as to exsanguinate the patient, or else, by compression, interfere with the proper exercise of the function of an adjacent viscus.

Violence directed against an extremity of the body, in the absence of fracture, dislocation, or external wound, may be serious in its consequences if an important joint underlie the seat of injury, for, in these cases, not only are seen the evidences of the contusion, but, in addition, an effusion of serum into the synovial cavity, a hemorrhage into the same place, a knocking off of a portion of the projecting rim of bone surmounting the articular surface, a displacement of an inter-articular fibro-cartilage, or rupture of one of the internal ligaments, when these exist, may complicate the external contusion and temporarily or permanently cripple the patient.

But even in those portions of the extremities which intervene between the joints, contusions are not always to be disregarded, in the absence of fractures, or even when complicated by a simple fracture, for in those cases where the violence is sufficient there may be added to the damage of the skin and subcutaneous tissue the still

further result of injury to the deeper blood-vessels, to the muscle-tissue, or the nerves. Injuries to these structures are due to the mechanical pressure to which they are subjected, being caught between the "agent" of the violence, and the resistance of the underlying bone. Under these circumstances, a large blood-vessel will either rupture, the blood escaping into the adjacent tissue and forming one of the varieties of traumatic aneurism, or the outer coats of the vessel will remain intact, and the interior, alone damaged, will favor the coagulation of the blood at this point, constituting the condition of thrombus.

The crushing force, in the case of muscle-tissue, robs it of its vitality, and obliterates the smaller blood-vessels, upon the integrity of which the establishment of a collateral circulation depends. When this damage is confined to a portion of one or possibly of several muscles, the reparative process of nature is capable of restoring the integrity of the muscle, without the advent of suppuration in such a manner as practically to leave behind no trace of the original injury, certainly so far as the function of the involved organ is concerned. When, however, the lesions are more extensive, the vitality of the extremity may be so disturbed as to result in gangrene. When this takes place, the muscle structure involved loses its healthy reddish appearance. It becomes paler in color, softer in consistency, more easily friable, and on microscopical examination the presence of a fatty-granular degeneration of individual muscle-fibre is revealed. The line of demarcation between the healthy and diseased portion of the muscle is well-marked in case a portion of the muscle-tissue, only, is involved.

When nerve-fibre is subjected to such pressure a neuritis is very apt to result. This accident is much more commonly encountered than serious lesions of blood-vessels or muscle-tissue. In this sense, at least, nerve-fibre seems to be much more delicate than either of the other classes of organs mentioned.

An extremely good instance of this accident is seen occasionally in those cases of dislocation of the shoulder, which have been reduced by the "heel in the axilla method." Under these circumstances, the axillary sheath containing the main branches of the brachial plexus is literally squeezed between the surgeon's heel and the resistance of the neck of the humerus. Although the force is exerted for a short time only, usually only for a few seconds before

the dislocation is reduced, a neuritis develops, causing much pain, and with the additional result that the muscles innervated by the nerves involved are completely or partially paralyzed, causing marked disability, which, especially obstinate to treatment, generally persists for months, and may even permanently cripple the patient.

All these different conditions, above described, develop immediately after infliction of violence. There remains, however, the consideration of the remote consequences of what, at the time of injury, is merely an ordinary contusion, not complicated by any lesion of the deeper structures.

Of these, osteomyelitis is frequently seen, especially in the young subject. In such cases the violence to which the bone is subjected renders it more likely to attack by germ invasion through the vascular system, in that the resistance of the normal bone-cells has been diminished by the force of the traumatism.

Then, again, how frequent it is possible in sarcoma of bone for the surgeon to elicit, in the history of the patient, the occurrence at some previous time of a contusion over the part involved, which had subsided without even, temporarily, incapacitating the patient.

The following cases are reported to illustrate several of the less common of the above-mentioned conditions :

Case I.—Comminuted Fracture (simple) of Olecranon—Dislocation forward of Bones of Forearm—Extensive Contusions of Forearm. —D. M., male, aged thirty-four, laborer, May 28, 1898. Previous history negative ; patient has always been healthy, and considerably stronger than the average man.

This morning, while working, patient fell a distance of twelve feet, through an open hatchway, striking a hard asphalt floor on his right side, the right arm being caught between the floor and the side of his body. (The patient, unusually well developed, weighs at least two hundred pounds.)

Immediately thereafter the patient suffered a great deal of pain over the region of the right elbow and forearm, and complained of total disability at the elbow-joint.

Examination in the out-patient department of the hospital revealed the presence of a comminuted fracture of the olecranon and a dislocation forward of the bones of the forearm.

In addition to the usual symptoms of the fracture and dislocation, there existed extensive ecchymosis around and below the elbow-joint, with considerable swelling of the corresponding soft parts.

The dislocation was easily reduced without the assistance of an anæsthetic, and, inasmuch as the semi-flexed position of the fore-arm did not disturb the contact of the broken fragments of bone with the shaft of the ulna, and the dislocation in that position showed no tendency to recur, the parts were immobilized with a posterior rectangular splint, well padded, the coaptative bandage extending from the fingers to the shoulder.

The patient, directed to return the following day for observation, neglected to follow this advice and did not present himself again for treatment until forty-eight hours after the accident had taken place.

On the removal of the splint, the swelling had perceptibly increased, especially in the forearm, and had extended to the dorsum of the hand and fingers. In the former situation large blebs had formed, while in the fingers the surface temperature and sensation were distinctly less than on the normal side. Subsequently the patient complained of slight pain and discomfort; his general condition, however, remained apparently normal.

A dressing of compresses, saturated with an aqueous solution of aluminium acetate, was applied to the arm and forearm under the rectangular splint, and the patient was directed to keep it thoroughly moist with hot water. At the end of another forty-eight hours (or four days after the accident) the local symptoms of swelling and blebs in the forearm, as well as those of impaired circulation of the fingers, had not abated.

The skin of the lower arm and of the entire forearm was still ecchymotic, and in places abraded, due to denudation of the blebs. The skin and subcutaneous tissue of the forearm had become more markedly œdematous, so as to easily pit on pressure. Beneath, in the deeper structures of the forearm, on its palmar surface, palpation detected a hard, firm, brawny swelling, without any evidence of elasticity or fluctuation, which was distinctly painful to the touch.

The fingers were considerably swollen, but not discolored; the skin investing them had become loosened, sensation in their extremities was diminished, but not absent; the surface temperature was less than that of the normal side.

The radial artery could be distinctly felt above the wrist and

pulsated with normal expansion; pulsation in the ulnar artery could not be detected on either side.

Owing to the gravity of the symptoms the patient was advised to enter the hospital. He was placed in bed and the arm enveloped in a dressing similar to that previously employed. His temperature at 11 A.M., four days after the accident, was 101° F., pulse 100, respiration 24.

June 9, twelve days after the accident. For the past week the local condition of the arm and forearm has changed only in that the swelling on the ulnar aspect has slightly diminished; on the radial aspect the swelling and œdema remain the same. The circulation of the fingers is still very much impaired, although pulsation in the radial artery has not changed in character; the skin investing the hand and fingers has come away, exposing an abraded surface, while the nails of all the fingers of the damaged limb, except the thumb, have fallen off, leaving a raw and slightly sensitive surface exposed to view. In other respects the condition of the parts have not changed. During this interval the temperature has varied from normal to 102° F., the pulse from 66 to 100, both showing a tendency to decrease rather than to increase.

The wet dressings were now discontinued, and to the arm and forearm, first invested with a thick layer of ordinary cotton, and the abraded surfaces protected by sterilized gauze, there was applied a loose plaster splint extending from the axilla to the heads of the metacarpal bones. The patient passed a comfortable night, complaining of no pain. On the following morning, twelve hours after the application of the splint, the extremities of the inner four fingers became discolored and the splint was immediately removed. Sensation over the discolored areas had entirely disappeared, and the surface temperature was that of the ward.

During the next few hours, the discoloration had advanced toward the trunk, the skin over the second phalanges being involved. It was therefore deemed advisable to explore the swelling in the forearm, in the hope that possibly some pent-up collection of blood might be allowed to escape, and in that way, by relieving any pressure which the presence of such fluid might exercise against the adjacent blood-vessels, the advancing gangrenous process in the finger-tips might be checked.

Operation.—June 10. Ether. An incision four inches long was

made over the radial aspect of the forearm, parallel to the edge of the supinator longus muscle, and this latter structure exposed. The dissection was carried down through the deeper parts, avoiding both radial nerve and artery, eventually exposing the supinator brevis. No exuded blood was found, nor any other condition that would explain the presence of the "deep swelling" above referred to, save the condition of the exposed muscles themselves. In a part of these structures, but especially in the supinator brevis, patches, light in color, could be distinctly seen, which did not bleed when pricked with the knife, and which contrasted very sharply with the adjacent healthy muscle not only by the difference in color, but also by the fact that these areas of degenerated muscle-tissue were much softer in consistency, and friable.

A second incision was made over the middle of the palmar aspect of the forearm, and the dissection carried down through the sublimis muscles. No fluid accumulation of any kind, either blood or pus, was found, but this muscle, unusually well-developed, contained many areas of degeneration, similar to those already described as existing in the supinator longus, or brevis muscles.

The wounds were loosely packed with iodoform gauze, and a wet 1–10,000 bichloride dressing applied. Both before and at the conclusion of the operation the radial artery pulsated normally just above the wrist.

On the day before this operation the morning and evening temperatures and pulse were as follows: A.M., temperature, 98.6° F.; pulse, 88. P.M., temperature, 102° F.; pulse, 98. On the morning before the operation, temperature, 100° F.; pulse, 98; while in the evening, four hours after the operation, the temperature had risen to 106.2° F., the pulse being 100.

June 11.—11 A.M., temperature, 104.6° F.; pulse, 98; respiration, 26. 3 P.M., temperature, 104.6° F.; pulse, 112; respiration, 28. 9 P.M., temperature, 104° F.; pulse, 92; respiration, 26.

Slight advance in the discoloration of the fingers. The dressing was not disturbed.

June 12.—9 A.M., Temperature, 103° F.; pulse, 100; respiration, 22. 12 M., temperature, 103° F.; pulse, 100; respiration, 26. 3 P.M., temperature, 103.6° F.; pulse, 102; respiration, 24.

Dressing of the Wound.—The swelling of the forearm had markedly increased, and had extended farther up the arm. It was tense

and hornirary and painful on pressure. The edges of the wound were distinctly sloughy and necrotic. The deeper parts of the wound had a similar but less marked appearance. The discoloration in the fingers was advancing slowly toward the dorsum of the hand. Under these circumstances immediate amputation above the elbow was urged and accepted.

Operation.—Circular amputation in the middle of the arm, below the insertion of the deltoid muscle. Digital pressure on the lower axillary, which caused the radial to cease pulsating at the wrist. There existed a high bifurcation of the artery, and the ulnar was secured by a clamp, immediately after the circular division of the soft parts.

After cessation of the hemorrhage the flap was brought over, a temporary iodoform gauze tamponade with silkworm sutures, and an aseptic dressing applied.

The patient, although losing only a comparatively small amount of blood, suffered from considerable shock. Two hours after the operation, temperature, 102.4° F.; pulse, 140; respiration, 24. Four hours afterward the pulse had diminished to 112°, and on the following morning was below 100°. The patient made an uneventful recovery, the temperature rising to 102.8° on the afternoon of the day after the operation, but thereafter gradually diminishing to normal. The pulse remained below 100. The gauze was removed on the fifth day and the stitches tightened. In this way primary union was practically secured, and the patient recovered fully with a comfortable stump.

EXAMINATION OF REMOVED PART.

The entire forearm was carefully dissected. The skin and subcutaneous tissue contained a considerable amount of old clotted blood. There was a small amount of the same material in the deeper inter-muscular planes. The exterior group of muscles was normal. The supinator longus and brevis, the flexor sublimis digitorum, the flexor longus pollicis, including its slip from the coronoid process, were the seat of extensive patches of degeneration, which involved the major portions of the muscular bellies, and which presented the appearance on gross examination, already described.

Areas of degeneration similar in character, but not so extensive,

were found in the extensor carpi radius longior and brevior, as well as the superficial flexor muscle and flexor profundus digitorum.

The tendons of these muscles presented a healthy appearance.

The radial artery was patent throughout. In the ulnar artery, one inch below the origin of the anterior interosseous, was a soft clot of blood, three and one-half inches in length, completely filling the lumen of the blood-vessel. The walls of the artery were apparently normal. Had a section of the vessel been examined microscopically, there would undoubtedly have been found some damage to the interior.

The thumb was normal in appearance. The extremities of the second, third, fourth, and fifth fingers were distinctly gangrenous, but presented no sharp line of demarcation.

Case II.—Severe Contusion of Foot and Ankle.—M. G., aged nine; female; August 21, 1895. This morning patient was brought to the hospital with an injury to the right foot, which was caused by the falling of a cake of ice, weighing about twenty pounds, upon the anterior and internal aspect of the ankle; patient complained of pain and inability to bear the weight of the body on that leg.

Examination.—Right foot and ankle markedly swollen, so that the adjacent bony prominences are obscured in outline. The skin is very tense, put upon the stretch by the effused blood beneath, and is bluish in color. There is no angular deformity. The ankle is flexed at about a right angle and the passive movements of the joint are normal. No preternatural mobility can be discovered and examination of the bones, so far as the swelling allows, reveals no fracture. The entire extremity distal to the ankle is somewhat numb. Sensation is blunted, though present, and there is perceptible decrease of surface temperature. Owing to the great swelling it is impossible to detect any pulsation in either the anterior or posterior tibial arteries. On admission, there were no constitutional symptoms of any kind.

The patient was put to bed, and compresses, saturated with a hot lead-and-opium solution applied to the swollen limb which was placed in an elevated position.

During the four days following the accident the swelling and ecchymosis persisted and began to involve the lower part of the leg. The skin of the foot did not regain its normal temperature, but became colder. Sensation in the same parts diminished constantly and

then disappeared. The surface of the ankle and lower one-third of leg became covered with the bullæ of mortification, while the skin assumed a dark hue, more or less of a mottled character.

After the patient's admission to the hospital the internal temperature had gradually risen, until at the end of the fourth day it was 102°, the pulse at the same time being 138. The patient was restless and sleepless, though not delirious, and suffered a great deal of pain.

Owing to the fact that the process of mortification was well established and was showing a tendency to spread up the leg without the formation of a distinct line of demarcation, and also inasmuch as the patient was clearly beginning to suffer from the symptoms of septic absorption, amputation of the leg was advised and accepted.

Operation by Dr. Hartwell, circular amputation at the point of election, just below the tubercle of the tibia.

Owing to the extension of the swelling up the leg, it was only with difficulty that sufficient flap of healthy material could be obtained from the soft parts of the upper part of the leg and knee. The flaps were brought together, therefore, under slight tension. Unfortunately suppuration took place, which was necessarily to be expected, owing to the proximity of a septic process, and the flap retracted. Subsequently, however, after a process of granulation lasting ten weeks, assisted by traction-wire, a three to six pound weight on the soft parts forming the lateral aspects of the knee, the stump was covered with healthy skin, united in the centre by a narrow band of cicatricial tissue.

Following the amputation, the septic symptoms previously mentioned abated and subsided gradually, the temperature and pulse of the patient reaching normal for the first time at the sixth week.

Examination of the part removed showed a large amount of blood beneath the skin and in the subcutaneous and deeper structure of the dorsum of the foot. The tissues presented the appearance of "jelly," being badly crushed, and the serous exudate infiltrated the tissue of the lower half of the leg. The anterior tibial artery could not be distinguished in the jelly-like mass in front. The posterior tibial, protected by the internal malleolus, was surrounded by extensive extravasations of blood, and, in its interior, as it passed behind the joint, there was situated a clot, filling the lumen of the vessel. The bones were normal, no fracture or dislocation being present.

In both of these cases the beginning death of the extremity was undoubtedly due to a damaged condition of the circulation of the part, and was not contributed to in the slightest degree by the pressure of the bandage. The pathological condition found after amputation consisted in a complete obliteration of the chief artery of the extremity at the point of violence. This, alone, is likely to result in gangrene only when the artery involved is a terminal one. In all other cases the remaining vessel, if patent and normal, should provide sufficient blood to maintain the vitality of the extremity. In the first case reported the radial artery was healthy and intact; in the latter case the condition of the anterior tibial vessel could not readily be ascertained. In both cases, however, that part of the local circulatory apparatus which is always chiefly concerned in the establishment of the collateral circulation, was practically destroyed in the extensive crushing of the musculo-tendinous planes. In the first case, the balance between the thrombotic ulnar artery and crushed tissue on the one side and the patent radial and the still viable muscle planes on the other, was of such an even nature that the advent of the gangrenous process was considerably delayed. In the second case, the crushing was so much more universal that the onset of gangrene was rapid and virulent.

In all similar cases of unusual trauma in the extremities, the possibility of consequent gangrene is, at times, largely influenced by the condition of the circulatory system. Thus, any condition of the arteries which limits the blood-supply of the part predisposes to gangrene. Chief in this category is the obliterating endarteritis of diabetes, gout, rheumatism, syphilis, and old age. Again, any condition that impedes the venous return has a similar effect. Thus phlebitis, with its accompanying thrombus, varicosities, with their resultant venous valvular insufficiencies, obstructive disease of the heart and lungs, particularly the different forms of non-compensating valvular lesions of the cardiac orifices, all favor the collection of blood on the venous side of the system and thereby interfere with the nutrition of the extremities.

Another predisposing feature consists in any change in the quality of the blood. Bright's disease, diabetes, the different diseases of the blood itself cause such a degree of low tissue vitality that moderate traumatism is frequently followed by serious results.

In the cases under discussion, however, it is important to empha-

size that the different portions of the circulatory apparatus at the time of the accident were normal in every respect, and that, notwithstanding the changes in the vessels and structures, the results of the trauma were such as to produce gangrene in the presence of an intact skin.

Case III.—Fracture of Clavicle.—Rupture of Intestine—W. W., aged seventy-two; male; October 8, 1898. This morning patient was struck by a falling spar over the right shoulder and right half of the body. Four hours after the accident occurred patient walked into the hospital complaining of pain over the right shoulder and inability to use the right arm. He also complained of a feeling of distention in the right side of the abdomen with some slight pain.

Examination.—A simple fracture of the right clavicle was detected about the centre of the bone, with the usual deformity and angular displacement. While standing up patient thought the abdomen was slightly larger than normal. In the recumbent posture this fulness disappeared, the abdomen becoming almost retracted. Palpation elicited an area of tenderness, rather more localized in the right lower half of the abdominal wall. There was no muscular rigidity and deep palpation failed to detect any tumor or other abnormal condition. There was no ecchymosis over the area of tenderness. Percussion showed no variation from the normal. Liver flatness being unchanged.

The patient's general condition was excellent. The temperature and pulse were normal, diaphragmatic respiration caused no inconvenience, there was absolutely no evidence of shock. As a matter of precaution the patient was advised to remain under observation in the hospital.

October 9. This morning, as a result of an injection, patient had a well-formed movement, containing no blood. Careful abdominal examination failed to detect anything abnormal. The pain and tenderness on pressure had almost disappeared.

Pulse, respiration, and temperature remained normal.

Suddenly, in the afternoon, twenty-six hours after admission, syncope developed, the patient became unconscious, and in two hours death took place with all the symptoms of shock. The patient had previously refused operation in case any indication for the same should occur during the progress of the case.

Autopsy.—There was found a small rupture of the ileum about

three feet above the ileo-cæcal junction on the right side, and in the immediate vicinity the evidences of a beginning septic peritonitis. These, with the fracture of the clavicle, were the only lesions found in the entire body.

Case IV.—Rupture of Small and Large Intestine—Intra- and Extra-peritoneal Hemorrhage.—P. O., aged fifty-six; male; May 25, 1898. Patient has had a double oblique inguinal hernia for the past three years. This has caused no trouble and has never received the support of a truss.

While loading a truck, fifteen hours before admission to the hospital, patient's abdomen was caught between the wheel of the truck and the corner of the platform of a moving street-car. The patient was immediately thrown to the ground and remained in an unconscious condition for several hours. He was brought to the hospital in an ambulance, and on regaining consciousness he complained of severe pain in the abdomen and vesical tenesmus.

Examination.—Patient conscious, but moderately apathetic. Skin cold and clammy, especially that of the extremities. Marked pallor of the surface of the body, especially of the visible mucous membranes. Pulse 130 to 140, and feeble. Respiration rapid and shallow. Temperature slightly subnormal. Patient is evidently suffering from symptoms of shock and internal hemorrhage.

Examination of the Abdomen.—The whole cavity moderately distended. The percussion-note is generally tympanitic, especially in the lower part. There is marked muscular rigidity, equally marked on both sides, and deep palpation is impossible on account of the pain. Examination of the bladder negative, six ounces of boracic fluid being injected and withdrawn without change.

There is a reducible inguinal hernia on the right side. The left inguinal canal, however, is occupied by a mass, corresponding in shape to a hernia, which remains of the same size, irrespective of the position of the patient. It is soft, moderately elastic in consistency, and dull on percussion. It cannot be made to disappear by pressure into the abdominal cavity. There is no impulse on coughing. The skin over it is discolored, and manipulation, which is slightly painful, detects, at times, an emphysematous crackle.

The patient was advised to submit to operation, but refused relief.

Fifteen hours afterward death took place from heart failure, the symptoms previously mentioned becoming gradually intensified.

Autopsy.—Chest normal. In the left inguinal region, in front, and in the left gluteal region, behind, there are distinct abrasions of the skin.

The peritoneal cavity contained a considerable amount of fluid blood and a moderate quantity of fecal material.

The ileum, two inches above the caput coli, presented a laceration, involving three-fourths of the circumference of the gut, which lay in close proximity to the orifice leading through the right internal abdominal ring into a hernial sac of the usual type.

On the left side the areolar tissue of the left inguinal canal outside of the hernial sac was infiltrated with a considerable amount of clotted blood. This extended through the external ring a short distance below into the tissues of the scrotum. In the left hernial sac there still remained a portion of the sigmoid flexure, which presented an extensive laceration, as well as a crushed bruised appearance, there being numerous ecchymoses beneath the serous coat. Extraperitoneally along the basin of the pelvis there had collected a considerable quantity of clotted blood. The kidneys presented the lesions of a chronic interstitial nephritis, without exudation.

These two cases of rupture of the intestine present the clinical appearances of opposite extremes. In the first case, the symptoms corresponded rather with those of slight intestinal indigestion or of a mild contusion of the abdominal wall, while, in the latter, the typical symptoms of ruptured gut could certainly not be confused with those of any other condition.

In the first case, before the advent of sudden syncope, and in the absence of any symptom pointing to the gravity of the condition, no one would maintain that operation was indicated. Had the patient been younger, the persistence of the pain, together with the tenderness, always remaining in the same situation, might justify an exploration, which is certainly not a surgeon's procedure. The case is a valuable illustration of the uncertainty and consequent difficulty which is encountered in the diagnosis of ruptured intestine. The particular lesson to be derived from the observation of such a case emphasizes the necessity of close and careful scrutiny of all cases of abdominal pain which results from traumatism, and which persists, unabated, until it becomes obscured by the development of grave constitutional symptoms of shock.

The second case is equally instructive, in that it affords an oppor-

tunity for studying the clinical features of a case of rupture of the contents of a hernial sac. In this instance the ileum on the right side, after being ruptured by the force of the trauma, returned into the abdominal cavity. On the left side, however, the sigmoid remained adherent to the wall of the sac, and as the bleeding from the ruptured surface took place, the major portion with the contents of the gut gravitated into the lowest part of the peritoneal cavity. Some, however, found its way into the hernial sac, both extra- and intra-peritoneal, and the former, in following the line of least resistance, infiltrated the areolar fat of the inguinal canal, and formed a tumor, that in many of its characteristics resembled those of a strangulated hernia. The absence of the usual tension of the tumor and of a distinct "neck" leading into the abdominal cavity, together with the discoloration of the skin, facilitated the differential diagnosis.

The crackling sensation was undoubtedly emphysematous, due to the escape of air from the interior of the gut.

In studying the clinical features of this case, one is still further impressed with the rapidity of its course, and the fact that the patient did not show any evidence of reaction before dissolution took place.

In the care of the traumatic cases of a hospital which has the largest ambulance service in a crowded district of this city, I have been impressed with the value of this symptom as an index for immediate and early operative interference. In fact there is a very distinct line of demarcation between cases of mild and severe shock, with reference to the interval that elapses before the subsidence of the symptoms of this condition.

Shock unaccompanied by complication, shows a tendency to rapidly subside; shock associated with rupture of internal viscus or hemorrhage shows, on the other hand, a marked tendency to grow more and more profound, and under these circumstances, the surgical proverb of "wait for the shock to subside before proceeding to operation" must be disregarded, if the life of the patient is to be saved. Early and prompt operation is the only remedy.

XIX.

A CASE OF PNEUMOTHORAX TREATED BY ASPIRATION.

By Herbert Swift Carter, M.D.,
late house physician.

A PATIENT with pneumothorax died suddenly and unexpectedly in the wards a short time before the admission of the case here reported. The utter futility of the usual expectant treatment was impressed upon the minds of all and resulted in the determination to try any measure which gave the least hope of relief in the next case that should come under observation.

The case which it is now desired to present was in one of the male medical wards of the hospital in W. P. Northrup's service, and it was under his direction that the treatment, which forms the interesting feature of the case, was successfully tried. Both these cases were tuberculous; in both the pneumothorax developed suddenly and dyspnœa and cyanosis were equally marked.

History.—Male, aged twenty-seven; Irish laborer.

Family History.—No tuberculosis.

Previous History.—The beginning of his present illness dates back one year, when he began to cough; the expectoration was at first mucous, but for the past seven months often blood-streaked. Loss of strength and flesh, thirty-five pounds. Two weeks before admission he had a slight hæmoptysis. Is moderately alcoholic. For a month previous has complained of sharp pain in region of right nipple.

Present Illness.—Three days ago, while at work, he was seized with a sudden, dull pain referred to precordium and tip of sternum. With it was a sharp pain in right scapular region, which lasted for about an hour. He had at once sudden and marked dyspnœa which has lasted ever since. Patient has not been able to lie down or sleep at all since onset. Cough has remained about as usual.

On admission to the ward the patient's condition was considered most critical, so much so that his family were immediately sum-

moned. The dyspnœa was intense. Sitting upright, grasping the sides of the bed, all accessory muscles of respiration being called into use, with extreme cyanosis, the patient presented a distressing appearance. A physical examination was immediately made and the following notes taken:

October 4, 11 A.M. Temperature, 99° F.; pulse, 132; respirations, 76. Patient is somewhat emaciated and greatly cyanosed, and is suffering from extreme dyspnœa.

Heart.—Apex in fifth space, four and a half inches to the left of median line. Action is somewhat irregular in force. No murmurs are heard, but there is marked accentuation of pulmonic second sound.

Lungs.—Right chest is bulging anteriorly from old deformity. Percussion-note is exaggerated all over and of tympanitic quality, except posteriorly close to vertebral column, where there is slight dulness. Breathing entirely absent except over dull area where there is a slight vesicular quality with numerous fine and coarse crepitant and subcrepitant râles. The impression gained is that the lung is bound by old adhesions close to the vertebral column; elsewhere signs of pneumothorax.

Left Lung.—Over upper lobe anteriorly there is slight dulness, breathing broncho-vesicular, same signs also in a few other scattered areas. Very many fine and coarse crepitant and sub-crepitant râles all over lung. Posteriorly practically the same signs.

Physical examination otherwise negative, except that the liver is displaced downward to a slight extent.

At first only the usual remedial measures for this condition were thought of and tried. Oxygen inhalations, nitro-glycerine hypodermatically, morphine and a cardiac stimulant of strychnine. All of these failed to give anything but temporary relief; the dyspnœa and cyanosis continuing practically the same.

On the supposition that the point of rupture of the lung through the visceral pleura might have become closed, or that the opening if still patent might be closed only by a valve-like bit of tissue (and the physical signs over the right half of the chest seemed to bear out this supposition) it was thought best to try the effect of aspirating the air from the chest in the hope that such a procedure would tend to the formation of a vacuum and so, at least, help the inspiratory efforts in dilating the collapsed air-vesicles. This was done at 9 P.M. with an ordinary bottle aspirator, using a fair-sized needle. A

bottle aspirator was used because it was the most aseptic appararatus, prevented ingress of air into the pleural cavity and afforded a rough method of measuring the air exhausted. The usual site of election below the angle of the right scapula was chosen, and when introduced, the needle was evidently in a cavity of some sort. After the formation of a high vacuum in the bottle by an air-pump, the cock was turned and air was plainly heard to rush into the bottle. The cock between lung and bottle was again closed and the procedure repeated. This was done four times, at the end of which the air in the chest was apparently exhausted, as the vacuum in the bottle remained unchanged and lung-tissue was distinctly felt rubbing and scratching against the point of the needle. The needle was then withdrawn and the puncture quickly closed.

The patient's relief was almost instantaneous, and in fact the dyspnœa decreased as the air was being aspirated, while a few moments later the patient fell asleep breathing comparatively easily and slept all night. After aspiration, temperature, 99.4° F.; pulse, 120; respirations, 36; a fall from 76, or 40 less respirations to the minute.

The success of the experiment was most gratifying, for the patient's condition continued steadily to improve. The next day evidences of progressive expansion of the lung were made out, as the percussion note was less exaggerated and the respiratory murmur could be heard about two-thirds of the way to the base of the lung all around. Daily the condition of the lung approached nearer and nearer to the normal, and at the end of ten days the expansion was practically complete, although there persisted what were evidently signs of scattered tubercular foci in both lungs. The position of the apex of the heart had also changed and was then in the fourth space, three inches and three quarters to the left of the median line—showing its position to have been originally altered, pushed downward and outward by the condition in the right half of the chest. The patient's general improvement was uninterrupted, and at the end of eighteen days he was out of bed; by degrees able to walk about; go up and down stairs and was discharged November 13, *i.e.*, forty days from day of admission, being only kept so long a time in order to give him a good start, as the conditions in his home were not such as would conduce to a satisfactory convalescence. The only other treatment used was the usual tonic and dietary régime, with the addition of creasote internally and by inhalation.

In reviewing the literature of pneumothorax of the past fifteen years, as expressed in the medical journals, with special reference to its treatment, the operation of simple puncture, or of aspiration, has been recommended or condemned by various writers. Indeed as early as 1747, according to Gaillard,* Combalusier describes a case in which a surgeon punctured the thorax to evacuate fluid, when much to his surprise air rushed out instead and the patient recovered. Running through all these years, however, one sees an increasing willingness on the part of the medical profession to try operative interference, but it is in most cases limited to the recommendation of relieving intrathoracic pressure when this rises above one atmosphere and allowing nature to proceed with the case, unless the pressure again increases as shown by the symptoms and physical signs, when the procedure is repeated. This, however, is only to equalize the pressure within and without the thorax ; makes no attempt at extracting all the air possible, and takes no account of the effect of aspiration on hastening the expansion of the lung.

For the purpose of equalizing pressure, Cayley † recommends the use of the trochar and canula, and Unverrichten,‡ in 1896, eleven years later, held the same view, but urged the formation of a fistulous opening in the thoracic wall for the relief of urgent symptoms, and to give the lung rest and a chance to heal. But as Aron § points out, the danger of infecting the pleura is so great by this method that he considers it unjustifiable, and indeed one hesitates to run the chance of converting what may be a simple pneumothorax into a pyo-pneumothorax which is very apt to occur if this is done.

In 1889, Ewart ‖ reported three cases of tubercular pneumothorax treated by aspiration, and although none of them recovered eventually, he was struck by the great relief afforded to the immediate symptoms. It was held, however, by many at that time to be a procedure not applicable to general practice. His conclusions were as follows : 1. Where the dyspnœa is urgent and there is a good chance of affording temporary relief and resting the heart, the operation is justifiable. 2. In cases of doubtful prognosis paracentesis does good by finding out if the perforation is healed, or if not, whether it is large or small.

* La Pneumothorax, Bibliothèque, Charcot, Debove.

† Transactions of the Clinical Society, vol. xvii., 55.

‡ Deutsche Med. Wochenschr., 1896, xxii., 349. § Ibid., 577.

‖ British Medical Journal, 1889, ii., 1098.

Of course, as Vickey,* Hadly,† Hoover,‡ Whitney,§ and others assert, the great danger of aspiration in earlier stages of pneumothorax is the possible reopening of a partially sealed rent in the visceral pleura, and at this time they confine themselves to recommending puncture or aspiration when the pressure is over one atmosphere, simply to the extent of equalizing it. Whitney holds that in tubercular cases no further attempt at withdrawing the air should be made until at least six weeks after an acute onset, while no less an authority than Fagge ‖ said that aspiration should never be done on account of this danger. In cases of pneumothorax resulting from trauma, Hopkins ¶ advises immediate aspiration in order to reduce the liability to infection of the pleura, and reports two cases so treated in which the good effects were immediate and lasting.

It can therefore easily be seen that the treatment of this case by aspiration, although it afforded instantaneous and permanent relief and materially hastened the expansion of the lung, for the most part runs contrary to the advice of such observers as already quoted. Still, although its success may have been owing to the fact that the pleural rent was tightly closed so soon after the acute onset (four days), the benefits were too striking to be lost sight of. In so far then as one case can prove anything, it shows that aspiration in acute pneumothorax, besides giving relief to the symptoms and hastening the expansion of the lung, constitutes, under favorable conditions, a valuable therapeutic measure. Presumably the favorable conditions referred to are, that either the pleural opening must be closed by a plastic inflammation, or that, if not tightly closed, some valve-like bit of tissue prevents the ingress of air into the pleural cavity.

Hence it is not from the fact that any originality is claimed for this procedure that the case is reported, but simply to call attention to a form of treatment the value of which has often been lost sight of and to urge its trial under similar conditions in order that more cases may be reported, and a definite knowledge of its usefulness established, or else sufficient adverse evidence obtained to discourage its use under what are apparently favorable conditions.

* Boston Medical and Surgical Journal, 1893, cxxix., 64.
† Clinical Journal, London, 1895–96, vi., 17–19.
‡ Cleveland Journal of Medicine, 1898, xxvi., 216.
§ Loomis-Thompson, 1898.
‖ Principles and Practice of Medicine, vol. ii., pp. 192, 199.
¶ Annals of Surgery, Philadelphia, 1898, xxvii., 216–219.

XX.

HEART-MURMURS AND HEART-LESIONS.

By Jerome Kingsbury, M.D.,
interne in pathology.

The following tables, designed to show the relation existing between endocardial murmurs and the condition of the valves as found at autopsy, are compiled from the records of seven hundred and twenty post-mortem examinations made at the Presbyterian Hospital, by the present Staff of the Pathological Department, and from the physical examinations of these cases made by the visiting and house physicians. In 379 of the 720 cases the clinical diagnosis of normal valves was confirmed at autopsy. One or two cases of patent foramen ovale (but where the circulation was evidently normal) and some cases where faint murmurs were heard when the patient was first admitted, but later disappeared, are considered "normal," together with cases where the only lesion was moderate atheromatous change at the base of the valves. In 45 cases of this group the weight of the heart ranged from fifteen to twenty-nine ounces.

In Table I. are collected 138 cases where lesions of the valve or orifice were present, and where the physical examination indicated valvular disease. Only murmurs evidently endocardial are considered; irregularity, feebleness, and accentuation of the sounds are noted in cases only when present with murmurs.

In 83 cases there were morbid changes in the valves, but no murmurs were detected with the stethoscope. In 38 cases but slight thickening or atheroma of the valves was present, of these the aortic was involved in 11, the mitral in 19, both aortic and mitral in 7, and in 1 the aortic, mitral, and tricuspid. The condition of the valves in the remaining 45 cases is recorded in Table II., B.

Table III. contains one hundred and twenty cases where the valves at autopsy were shown to be normal. Of this number murmurs were present in 102 cases, roughening of the sounds in 11, and in 7 there were murmurs with but slight change in the valves.

TABLE I.

Valvular Lesions and Endocardial Murmurs.

A. Lesion of the aortic valve alone.

Murmur at the Base.

Book.	Page.	Age.	Weight of Heart.	Lesion.	Murmur.
			Ounces.		
III.	61	.....	24	Aortic valve is a little thickened and retracted; considerable calcareous deposits about the aortic opening. Aorta is considerably dilated.	Diastolic murmur is heard at the base.
IV.	116	71	16½	Aortic valve is somewhat thickened.	All over the sternum to the left, as far as parasternal line and to right as far as midsternum, is a loud blowing, systolic murmur.
III.	3	66	.....	Aortic valve is slightly thickened. Aneurism extending from aortic valve to junction of transverse and descending portion of the arch of the aorta.	Loud rasping double murmur heard, loudest at the base and transmitted up and down the sternum, and heard also at apex and in the axilla.
IV.	175	38	11	Aortic valve is a little roughened on one of the cusps.	Systolic murmur, loudest over the pulmonary area and transmitted down the sternum.
V.	27	60	15	Aortic valve is a little roughened.	Faint systolic murmur at the base, most marked in second right interspace.
IV.	12	48	18	Aortic valve is thickened.	Just at costal angle, on deep pressure a rough murmur is heard.
II.	177	61	24½	Aortic valve is calcareous, and two of the cusps are adherent.	Decided roughening of the second sound.
II.	219	56	17½	Aortic valve has abundant vegetations, mostly yellow in color, with adherent clots. Two of the cusps united into one. One of the cusps has two perforations, $\frac{1}{10}$ inch in diameter, three in united cusps, one as large as the end of a lead pencil.	A blowing diastolic murmur is heard with maximum intensity at ensiform, also heard at the apex and in the second right interostal space.

Murmur at the Apex.

III.	109	61	24	Aortic; minute vegetation on the valve.	Well marked systolic murmur at the apex.
III.	216	21	16	Aortic valve is somewhat thickened.	Prolonged and loud murmur transmitted to the left, and heard all over the chest.
II	247	60	16	Aortic valve is markedly thickened.	Mitral systolic murmur.
III.	47	.....	12	Aortic; large and irregular vegetations, lacerations, and small ulcerations on the neighboring endocardium. One of the cusps perforated near its base.	A double murmur heard most plainly just to the left of the sternum, and on level with the nipple; heard also at base.
III.	210	23	12½	Aortic; two of the cusps grown together, covered with soft vegetations with a large perforation through the base.	First sound at the apex is reduplicated.

IV.	104	46	13	Aortic valve is a little thickened.	Faint systolic murmur at the base and apex.
IV.	147	.....	20⅓	Aortic valve is a little thickened. There is a fusiform aneurism of the ascending and transverse portions of the arch of aorta.	Systolic murmur at the apex transmitted into the axilla. Systolic rumbling at the base of the sternum.
V.	76	62	18	Aortic valve is calcareous, slightly thickened and irregular.	Systolic murmur at the base, heard loudest over the aortic region, with systolic murmur heard loudest over lower sternum and a considerable distance to the right of the sternum in the fourth and fifth intercostal spaces. Systolic murmur at the apex harsh in character and transmitted to the axilla.
II.	192	74	.....	Aortic; little smooth nodules in cusps of valve; cusps are calcareous near their attachment.	Aortic systolic murmur is heard in third space to right of sternum. A mitral systolic conveyed to axilla.
II.	562	42	37	Aortic; very slightly thickened at edge of valve. Arch of aorta from valve to left subclavian is twice normal diameter.	Second sound at the base seems distant. Some harsh bruit heard over base, loudest at midsternal line and all over anterior chest. Murmur with both sounds heard at apex—that with first transmitted to axilla.
II.	333	...	.....	Aorta; valve shows some thickening around corpora arantii.	Loud blowing systolic at base transmitted upward to the left. Systolic murmur at apex transmitted short distance to left.
V.	225	50	12	Aortic; valve is slightly thickened and roughened. Other valves are normal.	Systolic murmur at base heard loudest over the pulmonary valve. Second sound is blurred. Over mitral area is a harsh, rather inconstant pre systolic murmur. Also a soft systolic murmur conducted a short way into axilla.
II.	577	34	19½	Aortic; slight thickening, some adhesions, and retraction. Other valves normal.	Two murmurs at base transmitted upward to great vessels of neck Double murmur at apex.
II.	549	44	25⅝	Aortic; edges of valve thickened and retracted. Other valves normal.	Double murmur at base, sounds distinct from those at apex. Double murmur at apex.
II.	512	40	23	Aortic; valve thickened and contracted, some small vegetations at the edge.	Double murmur at base. Double murmur at apex.
IV.	49	.....	26	Aortic; valve thickened and retracted at orifice.	Double murmur at the base.
V.	47	48	24	Aortic; valve irregular with some contraction; considerable atheroma.	Systolic and diastolic murmur at apex, both somewhat transmitted to the left. At second left space less distinctly heard. Presystolic thrill at the apex. At base a systolic murmur heard loudest over sternum at level of fourth cartilage. Soft blowing systolic murmur at the apex; is not transmitted.
V.	101	54	... ...	Aortic; valve thickened at the edge and somewhat retracted.	Double murmur at base. Soft systolic murmur over mitral area. Jugular conspicuous, especially on left side, with apparent pulsation. Corrigan pulse.
IV.	272	46	23⅝	Aortic; valve slightly thickened and retracted.	Double aortic murmur. Diastolic portion being transmitted downward and to left and also heard at apex. Corrigan pulse. Faint blowing systolic murmur at apex.
III.	93	47	19½	Aortic; valve is much thickened and retracted.	Double murmur at base transmitted up and down sternum. Systolic murmur at apex transmitted to axilla.
IV.	69	51	19	Aortic; much thickening, partly calcareous, and retraction of the valve. Mitral valve little thickened. There is an aneurism of the ascending portion of the arch about two inches in diameter. Sacculated, encroaching upon the wall of the right ventricle. The cavities of ventricle and aneurism being separated by fibrous septa. The opening from the aorta into aneurism is about one and a third inch in diameter.	A rather harsh systolic and a fainter blowing murmur with the second sound. Faint systolic murmur heard as far as anterior axillary line, heard indistinctly in second left interspace, but quite distinctly over the ensiform.

Murmurs at both the Base and Apex.—Continued.

Book.	Page.	Age.	Weight of Heart.	Lesion.	Murmur.
			Ounces.		
V.	151	37	16	Aortic; two of the cusps are grown together and covered with fungous vegetations. One of the cusps being perforated, the other covered with several vegetations, and there are vegetations on the walls of ventricle below.	Double murmur over aortic area transmitted up and down sternum and heard over ensiform. Systolic murmur at apex transmitted to left.
II.	487	37	23	Aortic; extremely irregular; thickening of valve with calcifications and some adhesions. Beneath the valve is a small pocket, and under this a small abscess.	Double murmur is heard over the base. Double murmur at the apex.
V.	160	38	19	Aortic cusps much thickened and retracted.	Fairly loud double murmur over aortic area heard up and down sternum and along its right and left borders; the diastolic is transmitted along the long axis of heart to apex; Corrigan pulse. Systolic murmur over mitral area heard a short distance to left.
V.	123	38	26½	Aortic; greatly thickened and rigid with calcareous deposits. Orifice much stenosed, admitting. with difficulty, tip of one finger. Mitral normal; orifice perhaps little dilated.	Loud systolic at base most marked in second left interspace, heard distinctly in second right interspace and heard all over the præcordium. Presystolic and systolic at apex, systolic transmitted into axilla.

B. LESION OF THE MITRAL VALVE ALONE.

Murmur at the Base.

V.	218	55	13½	Mitral valve is a little thickened. Aortic is practically normal.	Systolic murmur heard over the pulmonary area.
IV.	88	58	14	Mitral valve is thickened. Aortic is normal, but has small calcareous deposits in orifice.	Faint systolic murmur in second left interspace sounds like a hæmic.
III.	262	17	.....	Mitral chordæ tendineæ perhaps a little contracted.	Diastolic murmur at base and reduplication of the pulmonic sounds. First sound at the apex is prolonged.
II.	405	25	15½	Mitral valve shows a fringe of small white vegetations along line of contact.	Second sound at the base is a little roughened.
II.	360	29	13	Mitral valve is a little thickened and contracted.	A transmitted systolic murmur is heard at the base.
IV.	233	39	9¼	Mitral valve is considerably thickened at the edges.	Heard over the base and transmitted down the sternum is a loud harsh systolic murmur.

Murmur at the Apex.

V.	194	7	9⅛	Mitral; edges of valve and chordæ are thickened but smooth. Orifice admits two fingers. Pulmonary corpora arantii slightly thickened.	Loud musical systolic murmur heard over the mitral area and transmitted into the axilla. The musical murmur is heard over the greater portion of the præcordium and over the pulmonary area. Rather soft systolic murmur heard over lower edge of sternum and just to the right. Systolic thrill felt at the apex.
III.	81	40	18½	Mitral and tricuspid; some thickening of valves.	Double murmur heard most plainly over sternum on level with nipple.

III.	207	33	18	Mitral; edge of mitral valve a little thickened.	Faint systolic murmur at apex.
II.	507	49	19½	Mitral; some roughening of valve.	Systolic murmur at apex.
IV.	33	52	14	Tricuspid; valve thickened. Mitral valve thickened. Some calcareous plates.	In fourth space three and a half inches from midsternum may be heard systolic murmur. Maximum intensity at ensiform.
II.	259	29	.....	Mitral; little more nodular than usual A chordæ tendinæ about three inches long stretches across left ventricle a little below aortic opening.	A murmur at the apex is heard.
III.	93	47	22	Mitral valve considerably thickened.	
III	246	56	24	Mitral; considerably thickened and retracted.	Double murmur at the apex.
II.	230	43	16½	Mitral valve is much thickened and retracted.	Systolic murmur at apex. To the right of apex a blowing systolic murmur is heard over a circumscribed area. Superficial murmur of probably pericardial origin is heard over the pulmonary area.
III.	151	20	24	Mitral; flaps and corda thickened; enormous vegetations on the left flap running up two inches (one and a quarter inches wide) on inner surface of left auricle.	Loud, harsh systolic murmur at apex transmitted to axilla and heard behind.
V.	34	25	13	Mitral valve is thickened; some ulcerations and vegetations on the auricular surface and anterior wall of auricle.	Harsh blowing systolic murmur heard loudest at apex and transmitted toward axilla; heard also over pulmonary area.
IV.	296	.....	17	Mitral valve and wall of auricle above covered with large vegetations, some soft and some calcareous.	Fairly diffuse loud blowing presystolic murmur. Also a loud blowing systolic murmur heard loudest at apex, but also over entire præcordium and in axilla at base. At apex when in sitting posture a marked presystolic thrill over an area two inches in diameter.
IV.	53	41	15	Mitral; enormous fibrous vegetations; above the opposite flap is an area of roughening of auricular surface.	Systolic murmur at the apex transmitted into axilla and heard in the back.
III.	54	19	19	Mitral; much thickened, very calcareous, right flap being pushed over so as to make a semi-lunar opening.	Loud, harsh systolic murmur, heard loudest at apex; heard also at lower end of sternum, transmitted into axilla, and also heard at back.
II.	299	51	10½	Mitral; extreme degree of mitral stenosis, the valves are much thickened and at the posterior junction of the two cusps is a calcareous deposit.	At the apex a rough murmur is heard non-circumscribed, apparently presystolic, but which on account of the great irregularity and jerky quality and feebleness of the heart's action cannot be placed absolutely in the cardiac cycle by the ear alone. Murmur has a rough sibilant quality. Distinct thrill at apex.

Murmurs at both Base and Apex.

IV.	132	60	12½	Mitral valve somewhat thickened.	Diastolic murmur at the apex transmitted to axilla. Systolic at base heard in second and third spaces; rough double and more superficial when pressure is made with stethoscope.
III.	179	38	12	Mitral valve a little thickened.	Systolic murmur at base to left of sternum Systolic murmur at apex.
II.	490	53	.....	Mitral valve and cords perhaps a little thickened and contracted.	Systolic murmur at base. Systolic murmur faintly heard at the apex.
IV.	41	50	14	Mitral valve little retracted.	Harsh systolic murmur at base in second left space transmitted down sternum. Soft systolic murmur at apex, also heard in the axilla.
III.	129	30	15½	Mitral valve presents numerous soft vegetations, also an area of three-quarters of inch in diameter on anterior wall of left auricle covered by granulations.	Systolic murmur at apex and at base.
IV.	248	28	16	Mitral valve and chordæ covered with large vegetations, and a large area of vegetations covers the anterior surface of left auricle.	Systolic at base loudest over pulmonary area. Loud systolic murmur over mitral area transmitted into axilla preceded by a short rumble. Systolic murmur heard in back, whole length of chest.

C. LESIONS OF BOTH AORTIC AND MITRAL VALVES.

Murmurs at the Base.

Book.	Page.	Age.	Weight of Heart.	Lesion.	Murmur.
			Ounces.		
II.	193	66	19½	Aortic valve is retracted and thickened. Mitral valve a little thickened.	Two murmurs at the base. Systolic transmitted upward, the diastolic downward and heard at apex.
IV.	156	.....	16	Aortic valve is thickened. Mitral is considerably thickened and retracted.	Rough systolic murmur heard all over the base. Accentuation of second sound.
V.	210	30	19	Aortic valve shows much thickening and contraction. On one cusp is a very large, firm vegetation, and the cusp has a perforation one-third inch in diameter. Mitral orifice will not admit readily two fingers. Is much thickened, contracted, and indurated. Somewhat calcified and shows some vegetations.	Double murmur heard at the base.

Murmurs at the Apex.

Book.	Page.	Age.	Weight of Heart.	Lesion.	Murmur.
III.	162	55	31	Aortic valve a little thickened. Mitral valve a little thickened.	Systolic murmur.
V.	48	61	16	Aortic valve has slight atheroma and vegetations. Mitral has slight atheroma and vegetations.	Faint systolic murmur at the apex that is not transmitted.
V.	87	36	26	Aortic; slight enlargement of the corpora arantii. Slight contraction of mitral.	Systolic murmur over the mitral area transmitted into the axilla.
II.	475	63	24	Aortic; small vegetations on the valve. Mitral valve a little thickened.	Blowing systolic murmur at apex transmitted to axilla and heard behind at about level of fourth dorsal vertebra.
II.	241	62	26½	Aortic valve is thickened and contains hardened nodules. Mitral curtains are thickened unevenly with calcareous plates. Auriculo-ventricular ring is much thickened and narrowed.	A mitral systolic bruit is heard.
V.	112	64	24	Aortic; slight vegetations on the corpora arantii; slight thickening and very slight retraction. Mitral admits three fingers; there is a slight thickening and retraction of the valve.	Harsh systolic musical murmur at apex transmitted to axilla. Peculiar friction murmur heard along border of sternum with the heart's systole in third, fourth, and fifth spaces.
II.	193	20	11	Aortic; minute vegetations on the valve. Mitral; moderate vegetations in line of union of the valve.	Roughening of first sound at the apex. Thrill at the apex.
V.	207	42	.....	Aortic; little thickened, but smooth, slightly contracted and some atheroma. Mitral; little thickened and slightly contracted.	Slight reduplication of second sound at base, more noticeable over the pulmonary area. Short presystolic rumble and a systolic murmur of a rather harsher character heard at apex—latter transmitted into axilla.
III.	123	32	12½	Aortic; very large yellow and very soft vegetations. Two of the cusps are perforated. Mitral, perhaps a trifle thickened.	Heard most plainly in fourth space to left of sternum; a systolic murmur also heard at apex.
V.	28	48	.....	Aortic; valve considerably thickened. Mitral; valve slightly thickened and contracted.	Loud musical systolic murmur over apex transmitted to axilla. Indistinct presystolic murmur at apex.

IV.	275	38	13	Aortic; cusps adherent to each other. Valve a little retracted and has nodule of calcareous deposit. Mitral thickened along edge.	A loud rather short diastolic murmur heard over mitral area transmitted up the sternum as high as fourth left costal cartilage and toward the axilla.
III.	77	16	18	Aortic valve has slight vegetation on one flap. Mitral valve and chorda moderately thickened and contracted.	Double murmur is heard at the apex.
III.	115	33	13	Aortic valve very slightly thickening. Mitral orifice admits one finger, marked thickening, calcification, and contraction of valve.	Loud rumbling murmur preceding and extending through the systole can be heard.
III.	62	24	23½	Aortic; semi-lunar vegetations. Mitral; abundant small vegetations along line of contact; toward middle thickened and contracted.	Loud blowing systolic murmur at apex transmitted to axilla and heard behind.
II.	394	....	16	Aortic; small soft vegetations at corpora arantii. Mitral; fringes of vegetation along edge of valve, soft and white. Chordæ tendineæ little thickened and contracted.	Systolic murmur heard at the apex of the heart and transmitted to axilla.
V.	139	26	13	Aortic; the cusps are a little thickened. Mitral; the cusps are greatly thickened and continuous with each other; orifice is slit that admits with difficulty tip of little finger.	Double thrill and murmur at the apex.
V.	167	24	10	Aortic; minute vegetations on all the cusps. Mitral; considerable mass of fibrin on both of the cusps. One being perforated.	Systolic murmur at apex.
V.	130	55	14	Aortic valve slightly thickened. Mitral valve is a little thickened, with a few vegetations on the border.	Systolic murmur over mitral area transmitted well around into the axilla.
IV.	240	27	19½	Aortic; valve slightly thickened; minute vegetation on the edge. Mitral; cusps thickened and grown together, fringed with vegetations.	Blowing systolic murmur heard over mitral area.
IV.	164	41	12½	Aortic; valve thickened. Mitral valve thickened—somewhat retracted. Just above mitral valve in auricle is a roughened area covered with fibrin.	Systolic murmur at apex transmitted into axilla.
IV.	51	48	20	Aortic; valve much thickened and rigid with calcareous deposits; considerable narrowing of the orifice; much crumbling calcareous material forming vegetations along the edge. Just below the level of the valve and between two of its cusps is a small ragged opening leading into an aneurismal sac, one inch in diameter, which projects upward just to right of aorta, between aorta and right auricle. Mitral; valve much thickened, rather rigid and a little retracted. No calcareous deposits.	Harsh systolic murmur at apex transmitted to axilla.
IV.	57	29	11	Aortic; valve a little thickened and contracted, adherent soft vegetations. Mitral; abundant soft vegetations along region of contact and on chordæ tendineæ.	Systolic murmur at apex transmitted toward axilla.
III.	226	62	22½	Aortic; much thickening, contraction, and calcification of valve Mitral; orifice admits one finger, outer part much thickened and rigid. Free edge somewhat thick.	There is a systolic murmur at the apex transmitted somewhat outward.
II.	175	37	.....	Aortic; irregularly thickened and contracted. Mitral valve thickened and has old soft vegetations.	Systolic murmur at apex.
II.	369	44	20½	Aortic valves thickened and nodular; one of the cusps is small. Mitral; one of the cusps is eroded.	Circumscribed systolic murmur audible at the apex.

Book.	Page.	Age.	Weight of Heart.	Lesion.	Murmur.
			Ounces.		
II.	202	43	17¾	Slight roughness in contiguous points of two of the cusps. Mitral valve perhaps a little nodular—chordæ tendineæ perhaps a little contracted.	Blowing murmur over aortic valve, which is also heard in the neck. Blowing murmur over apex transmitted to the left.
V.	136	59	14	Aortic; valve thickened. Mitral; little thickened and retracted.	Systolic murmur at base. Systolic murmur at apex.
III.	212	33	16½	Aortic; minute vegetations on valve. Mitral; minute vegetations.	Systolic murmur at apex and at the base.
II.	565	.....	33½	Aortic; valve thickened and calcareous deposits. Mitral; thickened and calcareous deposits on the valve.	An indistinct murmur with the first sound at the base. Double murmur at apex, the systolic being transmitted to the axilla and heard all over the front of the chest.
III.	214	72	20	Aortic; thickened and calcareous. Mitral; small vegetations on auricular surface. Orifice admits four fingers.	Systolic at base heard to left of sternum, transmitted upward. Systolic murmur at apex transmitted to the left and heard behind.
V.	164	63	.....	Aortic; two of the cusps are moderately thickened, the other has nodular calcareous deposits. Mitral; valve little thickened.	Systolic murmur at base. Systolic murmur at apex.
III.	98	64	.....	Aortic; considerable calcareous deposits on valve. Mitral; valve a little retracted.	Systolic murmur at apex transmitted to axilla, and a synchronous murmur at base, heard over whole length of the sternum.
III.	198	16	11	Aortic; vegetations on the valve, there are four cusps to valve. Mitral; vegetation on the valve.	Systolic murmur at apex and base.
V.	182	32	16	Aortic; slightly thickened. Mitral valve slightly thickened.	Faint systolic murmur in second left interspace. Faint systolic murmur over mitral area.
II.	505	.....	10	Aortic; posterior flap of valve perforated, opening into a pocket behind it, and apparently behind the endocardium, causing a bulging into the right auricle, at the tip of which bulging is a small vegetation. Also opens into left ventricle, and both inside and on ventricle surface are numerous vegetations. The left flap shows a large perforation and the auriculo-ventricular wall just below bulges toward the axilla. The edges of pocket thus formed show numerous vegetations. Mitral; trifle thickened and roughened.	Over the base and apex of the heart is a loud blowing double murmur; the diastolic murmur is heard over the great vessels at the base of the neck.
IV.	69	31	26	Aortic; one cusp much hypertrophied and perforated in two places and covered with granular vegetations. Other cusps thickened and a little retracted. Mitral valve is slightly thickened.	In the second right and left interspaces, and heard with equal intensity at left fourth cartilage, is a double aortic murmur of moderate intensity. There can also be heard the diastole with diminished intensity on the carotid vessels. At apex a murmur with both sounds, the systolic being preceded by a rough presystolic. In the axilla the latter is lost, the murmur with the second sound being faint or absent.
III.	7	43	39½	Aortic; contains small hard nodules, edges of valve thickened and inadequate. Mitral; contains small nodules. Small aneurisms at beginning of arch.	Double murmur at the base. Systolic murmur at apex.

III.	264	38	24½	Aortic; one cusp thickened and contracted. Mitral; possibly a little thickened at one spot.	Harsh blowing distant systolic murmur at base. Systolic murmur at apex not transmitted. Diastolic murmur at base transmitted down a short distance.
IV.	10	26	28	Aortic; cusps eroded, covered with vegetations, some of them calcareous. One small aneurismal sac one-half inch in diameter lying between left auricle and aorta, opening just beneath one of the cusps of the aortic valve. Mitral; thickened and little retracted; slight vegetations on edge and upper surface.	Systolic murmur at apex transmitted to the left.
III.	143	70	23	Aortic; some calcareous deposits at base and valves are retracted. Mitral; normal, but somewhat enlarged.	At base and heard down sternum is a well marked regurgitant murmur. Also murmur with first sound. Systolic murmur at apex transmitted to axilla.
IV.	131	45	20	Aortic; large calcareous and some softer vegetations, contractions, adhesions; edge of flap broken in one place. Mitral; many low vegetations, moderate, slight contraction. Surface broken in places.	Loud diastolic murmur heard over lower part of sternum seems to be transmitted from aortic valve. Loud systolic murmur in second right space; Corrigan pulse. Loud systolic murmur at apex transmitted to the left.
V.	57	42	17½	Aortic; one cusp of valve is a little thickened and contracted. Mitral valve much thickened. Abundant vegetations—hard and soft. A long patch of low vegetations runs up from valve on lining of left auricle. The chordæ tendinæ, much thickened, have vegetations attached to them, several are broken so that part of flap is not held by cord.	Systolic murmur at base in second left interspace. Systolic murmur at apex transmitted into axilla heard all over the back very loudly. Thrill at apex with diastole. In third space is rough thrill with the systole.
II.	223	.....	.....	Aortic; valve has slight fringe of vegetations. Mitral; fringe of vegetations on the valve. Slight thickening of flaps and chordæ tendineæ; on right flap anterior corner is a pea-sized nodule.	Over aortic a double murmur is heard of which the systolic is transmitted into vessels of neck—the diastolic down sternum. Systolic murmur at apex transmitted to the axilla. Slight systolic thrill.
IV.	28	23	9	Aortic; very few vegetations on valve. Mitral; valve retracted; a fringe of vegetations around the edge.	Soft mitral murmur transmitted toward axilla. Over second left interspace transmitted a short distance up and to right, also down sternum, is a harsh blowing murmur which is accompanied by a clear sharp click. Systolic thrill over whole præcordial area.
III.	128	15	13	Aortic; abundant calcareous vegetations on valve; endocardium of left ventricle thickened in places. Mitral; some retraction of valve; calcareous vegetations on under surface of one flap.	At apex a prolonged harsh systolic murmur transmitted all over the chest.
V.	60	29	15	Aortic; valve much thickened and contracted; few minute vegetations. Orifice stenosed so as to admit index finger alone. Mitral; admits with difficulty the tip of the little finger. Cusps are greatly thickened and contain lime-salts, in places with a few minute vegetations.	A loud systolic murmur heard over sternum at level of third costal cartilage and heard from this faint downward to ensiform. Maximum intensity in fourth space close to the sternum. Heard along right edge of sternum in third and fourth interspaces. Systolic murmur faintly heard over mitral area.
V.	95	45	.....	Aortic; enormous calcareous excrescences on and below valve. Flaps irregular, hard, and contracted. Mitral; adhesions and calcareous deposits. Flaps thickened and irregular, with soft vegetations; chordæ tendinæ thickened.	Systolic murmur at base loudest at midsternum opposite second interspace; heard up and down sternum. Systolic murmur at apex transmitted into axilla.
IV.	161	35	14	Aortic; valve covered with fungoid masses. Mitral valve covered with fungoid masses.	Systolic murmur at the base. Systolic murmur at apex transmitted to axilla; soft murmur heard all over præcordium, all blowing in character.

Murmurs at Base and Apex.—Continued.

Book.	Page.	Age.	Weight of Heart.	Lesion.	Murmur.
			Ounces.		
V.	20	....	20	Aortic; old thickening and some soft vegetations on the valve.	Systolic murmur at the base over aortic area.
				Mitral valve thickened and contracted; orifice admits one finger; several soft vegetations on the edge.	Systolic murmur at apex transmitted to the left.
V.	220	30	20½	Aortic; edge of the cusps greatly thickened and covered with ragged granulations, some of which are calcareous. Just above the cusp, which has no coronary artery in its sinus, is a minute opening leading into a minute sac on the outer surface of the aorta, evidently a beginning aneurism.	Faint double murmur over base heard loudest over pulmonary area; heard also up and down sternum. Some accentuation of pulmonic second sound; Corrigan pulse, though not marked.
				Mitral orifice of normal size; cusps of the valve slightly thickened, some minute vegetations on the under surface of the right cusp. The chordæ attached to this cusp are covered with polypoid masses of granulations, some of which are calcareous.	Presystolic and systolic murmur at the apex; the latter transmitted to axilla.
III.	130	43	15	Aortic valve covered with vegetations; some old, others fresh.	At base musical murmur is heard with second sound.
				Mitral valve covered with vegetations; some old, some fresh.	Systolic murmur at apex transmitted into axilla and heard in back.
V.	25	50	23½	Aortic valve much thickened and retracted; the orifice admits but one finger.	At base systolic loudest over pulmonary area. Diastolic loudest over sternum at level of fourth costal cartilage, transmitted up and down sternum.
				Mitral valve much thickened and retracted, together with chordæ tendineæ. Orifice admits of the tips of two fingers.	Harsh systolic murmur at apex transmitted into axilla.
III.	196	24	18	Aortic; thickened and little retracted; vegetations on margin. Also patches of vegetations just below on wall of ventricle.	Double murmur at base.
				Mitral; some thickening of valve; mass of vegetations on one cusp.	Loud systolic murmur transmitted downward and to the left.
V.	105	42	18	Aortic; one cusp perforated by a ragged ulceration with vegetations on the edges. Other cusps thickened; some vegetations and slight ulcerations. Orifice of valve is stenosed, admitting only one finger.	Diastolic murmur heard most faintly over the aortic area; best in the third left space near the left border of the sternum, and fairly well over mitral area and at apex.
				Mitral orifice stenosed, admitting only the tips of two fingers. Cusps much thickened with small vegetations on them.	Double murmur at apex. Systolic is loud, soft, blowing, transmitted to axilla. The presystolic is not well defined.
V.	107	47	19	Aortic; abundant very large vegetations, irregular, mostly soft, with thickening and distortion of cusps. Some vegetations along upper border of sinus of Valsalva, and here there is a small perforation of valve closed in by the pericardium.	In second right interspace is a short, harsh systolic and diastolic murmur not transmitted.
				Mitral; abundant vegetations, some of which are soft and apparently fresh. Along edge of auricular surface, a few attached to chordæ tendineæ; a very few flat ones running up along the line of the auricle. Abundant, very soft vegetations, on the ventricular surface of the right flap.	Loud, blowing, systolic murmur at the apex transmitted to the left and heard posteriorly between angle of scapula and vertebral column. There is a very distinct epigastric pulsation observed.
IV.	114	18	24	Aortic; orifice much contracted, admitting one finger. Cusps are very much thickened and retracted.	Diastolic murmur heard over the præcordium. There is a systolic murmur at base heard with maximum intensity over ensiform. A systolic murmur also heard in second right space.
				Mitral valve much thickened. Cusps adherent to each other; orifice admitting index finger alone; chordæ tendineæ much thickened and contracted.	Systolic murmur at the apex that is transmitted into the axilla.

D. TRICUSPID VALVE AFFECTED.

V.	129	16	15½	Aortic; cusps of valve very much thickened and a little retracted. Mitral; marked thickening of valve and chordæ and some retraction. Tricuspid valve slightly thickened, with row of minute vegetations along the free border.	At apex a loud systolic murmur transmitted to the back and heard both sides of spinal column; murmur heard also over ensiform. Limited to apex is heard a loud, harsh rumbling murmur (presystolic) heard immediately after closure of aortic valve, becoming more intense and running up to the first sound. At apex is presystolic thrill which at times fills entire diastolic period.
IV.	15	55	16	Mitral valve much thickened; cusps adherent; chordæ tendineæ contracted and thickened. Tricuspid valve thickened, retracted, and cusps adherent to each other.	Systolic thrill and murmur at apex. Apex and radial pulse asynchronous. Some impulse not transmitted to the wrist.
III.	48	19	18	Mitral valve thickened and contracted. Orifice admits one finger only. Tricuspid little thickened and contracted.	Double murmur at apex, systolic being transmitted into axilla and over entire sternum. Distinct thrill at apex.
IV.	186	47	12	Aortic valve slightly thickened. Mitral valve thickened and roughened. Tricuspid valve thickened.	Soft systolic murmur at apex transmitted into axilla.
IV.	21	26	13	Aortic valve very much thickened and contracted irregularly, ventricular surface below the valve being roughened. Mitral valve much thickened and contracted. Tricuspid valve considerably thickened and contracted.	Loud blowing murmur occupying whole of diastole extending into second silence. At base in second left space is soft systolic murmur with second sound transmitted down sternum. Presystolic thrill.
III.	188	10	9½	Aortic valve thickened and retracted, with vegetations on cusps. Pulmonary has a few vegetations. Mitral valve much thickened and retracted with vegetations on edge. Tricuspid; slight rim of vegetation, and valve itself is thickened.	Blowing murmur at base; second sound sharp and ringing. Double murmur at apex. Presystolic sharply localized just outside the nipple. Systolic heard all over chest.
IV.	246	26	9½	Tricuspid; patch of recent vegetations on one flap of valve and another patch in wall of ventricle contiguous to it.	Musical systolic murmur over aortic area. Blowing systolic murmur over mitral and pulmonary area, not transmitted.
IV.	27	54	.....	Aortic valve much thickened; soft vegetations much contracted. Mitral valve thickened; slight vegetations. Tricuspid valve thickened.	Murmur with second sound faintly heard in second left space and transmitted down sternum; is a rather harsh diastolic murmur. Soft systolic murmur.
III.	192	48	14½	Aortic; exceedingly thick, somewhat contracted; few vegetations. Mitral valve very much thickened and contracted; also tricuspid.	Double murmur at base. Double murmur at the apex.
III.	147	33	18	Aortic; thick and somewhat rigid. Mitral orifice very much contracted and surrounded by abundant deposit of lime leaving orifice about three-quarters of an inch long, one-eighth inch wide. Tricuspid valve appears considerably contracted and thickened.	Double murmur at the apex.
II.	282	17	17	Aortic; slight thickening and adhesion at the angles; minute vegetations on the corpora arantii. Mitral orifice will not admit one finger. Flaps and chordæ thickened; very minute vegetations at edge of opening. Tricuspid valve slightly funnel-shaped and will not admit three fingers.	Double aortic murmurs are heard. Double mitral murmurs and a decided thrill with the first sound of the heart.
V.	227	39	13	Mitral orifice admits, with difficulty, the tips of two fingers. The cusps are thickened and retracted, with a fringe of small vegetations around the edge. The chordæ tendineæ are also a little thickened and retracted. Tricuspid valve is a little thickened and the chordæ tendineæ retracted.	Systolic murmur over the mitral area of a musical quality transmitted into the axilla. A very faint systolic murmur heard over lower portion of sternum. Some accentuation of pulmonic second sound. The cardiac impulse shakes the whole chest-wall.

D. TRICUSPID VALVE AFFECTED.—*Continued.*

Book.	Page.	Age.	Weight of Heart.	Lesion.	Murmur.
			Ounces.		
IV.	279	19	18	Aortic valve is thickened; patches of vegetations on the cusps. Mitral valve is much thickened, with vegetations along entire edge; the chordæ tendineæ are thickened. Tricuspid valve has a fringe of minute vegetations on the edge.	At the third left interspace the closure of the pulmonary valve can be distinctly heard. There is a harsh presystolic murmur at the apex, heard also in the axilla. Systolic murmur heard loudest at third left interspace, with marked accentuation of the pulmonic second sound.
II.	272	36	17	Tricuspid; polypoid vegetations one-half inch long, with firm yellow surface and rough, numerous minute vegetations on the valve, chordæ tendineæ, musculi papellares, and the ventricular wall.	Slight blowing murmur heard at the apex during systole. An impairment of aortic sound heard at the base. These murmurs are inconstant and evidently hæmic.
V.	88	18	18	Aortic; all the cusps are very much thickened and retracted. Mitral orifice admits only tip of index-finger; cusps are merged into one; are very much thickened and edges implanted directly on edge of the columnæ carneæ, which are very much hypertrophied; there are no vegetations. Tricuspid orifice admits five fingers easily. All three cusps are shrunken and numerous vegetations are on auricular surface.	Faint double aortic murmur heard up and down sternum and over pulmonary area; also soft blowing systolic murmur and blowing over ensiform and to the right. Presystolic and systolic murmurs heard over mitral area; the latter transmitted to the axilla. Systolic thrill over the apex.

E. PULMONARY VALVE AFFECTED.

IV.	180	28	12	Pulmonary valve has one normal cusp; other two covered with large masses of granulations. One is perforated and the other almost entirely sloughed away.	Diastolic murmur heard at the base. Faint systolic murmur at the apex transmitted to the axilla.

F. WITH INCOMPLETE SEPTA.

V.	224	23	13	Aortic valve is normal; other valves somewhat thickened but soft. Mitral orifice admits two fingers. Tricuspid admits four fingers freely. The two auricles communicate by an opening one and one quarter inch in diameter with smooth edges nearly circular.	Double murmur at the base. Presystolic and systolic murmur at apex, the latter transmitted into axilla. Slight systolic thrill.
V.	166	38	24	Aortic valve is slightly thickened at edge; cusps are drawn together. Orifice admitting tightly the thumb. Foramen ovale is patent, the opening being one inch in diameter with a smaller opening one-quarter inch in diameter.	Double murmur at the base. Double murmur at the apex. Veins are dilated and pulsating.
III.	.....	.....	.....	Pulmonary valve; two of the cusps are adherent going to form one; a hard fibrous nodule is at the junction. Other valves are normal. Just below the aortic valve an opening through into interventricular septum connecting right and left ventricle which easily admits forefinger.	In the second intercostal space to left of sternum a loud superficial sawing murmur, increased in intensity by firm pressure. A systolic murmur at apex pretty generally transmitted. Systolic impulse in second left space. Systolic thrill at apex and in second left intercostal space.

TABLE II.

Valvular Lesions Without Murmurs.

A. slight thickening or atheroma of the valves, 38.*

Aortic	11	Aortic and Mitral	7
Mitral	19	Aortic, Mitral, and Tricuspid	1

B. greater changes in the valves, 45.

Aortic.

Book.	Page.	Age.	Weight of Heart.	
			Ounces.	
II.	498	54	13	Aortic valve is extremely and irregularly calcified, two of the flaps being blended into one.
V.	15	43	28	Aortic valve is moderately thickened and retracted.
V.	64	77	21	Aortic valve is a little thickened and irregular.
V.	208	24	13½	Aortic; two of the cusps have grown together from old inflammations.
III.	52	45	8	Aortic: slight old vegetations.
II.	502	65	10	Aortic valve is slightly contracted.
III.	265	28	9	Aortic; two cusps adherent, other cusps retracted.
II.	476	48	18½	Aortic valve is moderately thickened and contracted.
II.	446	42	8	Aortic; cusps are slightly thickened and two of them adherent at angle.
III.	209	40	28	Aortic valve thickened and two of the cusps adherent.
III.	219	23	10	Aortic valve shows some thickening and contraction. Two of the cusps united into one.
II.	528	15	11½	Aortic valve is thickened, adherent, and contracted.

Mitral.

IV.	22	56	10½	Mitral valve thickened, contracted, and calcareous.
IV.	264	28	13¾	Mitral has a fringe of vegetations along edge of the valve.
V.	26	19	10	Mitral valve shows several small vegetations close to margin.
IV.	73	53	10	Hard calcareous ring in left auriculo-ventricular opening. Mitral otherwise normal. Some atheroma of aortic valve.
V.	118	64	12	Mitral and its chordæ a little thickened and retracted.
II.	462	.....	8	Mitral valve has numerous vegetations, rather large and very soft.
III.	73	52	13½	Mitral; large, rather soft irregular excrescences on the valve.

* Eight of the organs in this group weigh over fifteen ounces.

Mitral.—Continued.

Book.	Page.	Age.	Weight of Heart.	
			Ounces.	
IV.	35	25	.....	Mitral; small warty excrescences on the valve.
II.	557	32	10½	Mitral; very slight old vegetations on the valve.
II.	223	23	12	Mitral; small firm vegetations on the tips of cusps.
V.	62	42	11	Mitral valve is a little thickened and has a few vegetations.
III.	161	20	9	Mitral valve shows recent vegetations.
II.	536	40	12	Mitral valve shows some vegetations.
II.	497	50	.....	Mitral a little thickened and contracted.
				Mitral and Aortic.
IV.	50	32	8	Aortic valve slightly thickened with vegetations. Mitral; some thick and rough vegetations on the valve. Orifice admits just one finger.
IV.	46	54	15	Aortic valve contains some calcareous matter. Mitral valve is a little retracted.
IV.	299	45	10	Aortic; considerable thickening of cusps and slight vegetations on the valve. Mitral valve a little thickened. A calcareous deposit just beneath the mitral attachment.
III.	6	44	9¼	Aortic; some soft vegetations on flaps. Mitral valve thickened—soft vegetations on edge.
II.	543	39	26	Aortic valve is a little thickened. Mitral valve a little thickened and contracted.
V.	53	31	17½	Aortic valve is a little thickened and contracted. Mitral also thickened and contracted.
III.	91	50	14	Aortic valve is thickened and calcified. Mitral valve thickened, retracted, and shows considerable calcareous degeneration.
III.	256	21	6¼	Aortic valve shows a few minute vegetations. Mitral valve has a fringe of recent vegetations close to the margin.
IV.	295	71	20	Aortic valve thickened; minute vegetations on edge. Mitral valve a little thickened.
II.	352	34	20	Aortic; edge of valve contains hard nodules and one cusp eroded. Mitral; edge of valve contains hard nodules.
IV.	291	54	17	Aortic; cusps are thickened. Mitral valve much thickened; cusps adherent, causing stenosis; some small vegetations; chordæ tendineæ is retracted.
IV.	159	44	12	Slight adhesions and roughness of the valves.
				Other Valves Affected.
II.	572	55	11½	Fibrous thickening of two of the flaps of the pulmonary valve. Also a rudimentary fourth flap to valve.
III.	211	70	12	The mitral, aortic, and tricuspid valves thickened.
II.	301	40	10½	Mitral orifice admits only one finger. Tricuspid valve a little thickened; chordæ tendineæ also a little thickened.

III.	250	70	22	Aortic; two of the cusps somewhat adherent to each other; rigid calcareous nodules just beneath the aortic valve. Tricuspid valve is bound down by adhesions. In the left ventricle is a small pouch admitting the tip of the finger nearly down to the adherent flap of the tricuspid valve.
II.	303	28	9	Mitral valve is much thickened. Tricuspid; thickening of margin of valve, and there are some erosions.
				Other Lesions.
IV.	238	39	10	Mitral valve is nodular. Attached to cords in the right ventricle are several clusters of fine white firm nodules.
III.	132	59	18½	Aortic; moderate vegetations on the valve and a little adhesion of two of the flaps. Mitral; moderate vegetations on the valve. At the base of the heart a firm mass 3 × 2 × 1½ inches, on section partly yellow, gray, and red, lying behind and to the right of the left auricle and superior vena cava. Projecting from this into left auricle is a nodular polypoid mass 1 × ½ × ½ inch. (Microscopal examination proved this to be sarcoma.)*

* Note of Physical Examination.—No murmurs. Some roughening of both sounds at the apex. At the apex grating sounds are heard with both sounds of the heart still heard when patient holds breath. Sounds heard over præcordium, but diminished when breath is held. Origin?

TABLE III.

Murmurs Without Valvular Lesions.

Murmur at the Base.

Book.	Page.	Age.	Weight of Heart.	Disease.	Murmurs.
			Ounces.		
II.	179	45	16	Phthisis.	There is an aortic systolic murmur and slight change of first sound at the apex—hardly a murmur, however.
III.	191	56	17	Hypertrophic cirrhosis of liver.	In fourth space to left of sternum a systolic murmur transmitted upward into great vessels of neck.
III.	217	26	9	Phthisis.	Systolic murmur at the base.
V.	188	31	.....	Ulcerative colitis.	Systolic murmur at the base.
III.	282	36	.....	General miliary tuberculosis.	Systolic murmur at the base.
IV.	36	38	9	Cancer of stomach.	Systolic murmur at the base.
III.	138	52	.....	Arsenical poisoning.	Systolic murmur at the base.
III.	208	35	10	Alcoholism.	Systolic murmur at the base.
IV.	152	.....	27½	Cerebral hemorrhage.	Systolic murmur at the base.
V.	149	22	9	Suppurative thrombosis.	Systolic murmur at the base.
II.	216	21	.....	Pericarditis.	Systolic murmur at the base.
III.	160	34	9	Peritonitis.	Systolic murmur at the base.
V.	75	22	9	Puerperal sepsis.	Systolic murmur at the base.
V.	68	53	10	Acute lobar pneumonia.	Systolic murmur at the base.
V.	70	30	.....	Mercurial poisoning.	Systolic murmur at the base.
II.	361	26	9½	Phthisis.	Localized systolic murmur at base.

Murmur at the Base.—Continued.

Book.	Page.	Age.	Weight of Heart.	Disease.	Murmurs.
			Ounces.		
V.	85	35	12	Appendicitis.	Faint systolic murmur at base, maximum intensity over pulmonary area.
V.	203	38	9	Ulcer of stomach.	Systolic murmur at base, heard loudest in second left interspace close to sternum.
IV.	169	45	16	Chronic nephritis.	There is a murmur at the base, with the second sound transmitted down the sternum. Loudest in the first and second interspaces. Accentuation of second sound. Some epigastric pulsation.
IV.	60	22	.....	Fæcal fistulæ following operation.	Soft blowing systolic murmur in second left space transmitted into neck.
IV.	149	58	14	Chronic nephritis.	Faint systolic murmur at the base.
IV.	99	54	22	Chronic nephritis.	Double murmur at the base.
V.	197	23	8	Septic thrombosis.	Systolic murmur over pulmonary area, with some accentuation of the pulmonic second sound.
III.	164	30	9	Acute lobar pneumonia.	At the base and to the left of the sternum is a blowing systolic murmur.
V.	113	25	10	Chronic nephritis.	Faint systolic murmur over the pulmonary area. Very marked accentuation of pulmonic second sound.
II.	467	.....	11	Lobar pneumonia.	Loud blowing murmur at the base.
III.	290	55	9½	Ovarian cystoma.	Systolic murmur at base transmitted upward.
III.	257	.....	.....	Aneurism involving entire arch of aorta.	Systolic murmur over the base. Systolic thrill in third right interspace.
III.	85	29	8	Pyosalpinx.	Systolic murmur heard most plainly to the left of midsternum.
IV.	176	27	.....	Broncho-pneumonia, chronic pleurisy.	Systolic murmur at base, loudest in the third left interspace. Accentuation of the second sound.
III.	222	62	30	Cardiac hypertrophy and dilatation, chronic nephritis.	A murmur with second sound, but not constant.
IV.	67	40	.....	Pericarditis.*	Faint systolic murmur at base.

Murmurs at the Apex.

IV.	253	64	14½	Acute lobar pneumonia.	Blowing systolic murmur at apex.
IV.	47	33	19	Chronic diffuse nephritis.	Systolic murmur transmitted a short distance down and to the left. At the base is a reduplication of the second sound.
IV.	286	2mos.	.....	Indigestion.	Rather rough systolic murmur at apex.
IV.	247	51	18	Cerebral softening.	Accentuation of second sound at apex and base. Faint systolic murmur over the mitral area.
III.	119	23	10½	Cerebro-spinal meningitis.	Faint systolic bruit at the apex.
II.	437	13	8	Chronic diffuse nephritis.	Over apex is heard a loud, rough bruit, not transmitted to the axilla.
IV.	189	32	8½	Typhoid fever.	Systolic murmur at apex transmitted a short distance.
IV.	58	29	8½	Dilated stomach.	Systolic murmur transmitted into axilla.
II.	297	30	11	Fractured ribs.	Mitral regurgitant murmur.
II.	518	56	24	Pernicious anæmia.	Systolic and presystolic murmur at the apex.
II.	200	32	.....	Chronic diffuse nephritis.	Mitral systolic murmur. Accentuation of aortic sound.
IV.	58	36	13	Acute lobar pneumonia.	Soft systolic murmur transmitted to the axilla. Sound weak at base. Second pulmonary sound accentuated.

* Pericardium everywhere adherent. Pericardium and central part of diaphragm are blended in thick calcareous plate which is grooved to fit the anterior surface of bodies of vertebra—and from this plate a ring, partly calcareous and partly fibrous, encircles the heart at junction of the auricle and the ventricle.

II.	466	35	12	Cancer of stomach.	Systolic murmur at the apex. It is transmitted up and to the right and is heard at the base.
IV.	212	29	13⅓	Cirrhosis of liver.	Systolic murmur with first sound heard at apex and up left of sternum. Accentuation of second aortic sound.
IV.	94	17	11	Chronic nephritis.	Systolic murmur transmitted into the axilla. Some accentuation of the first sound.
II.	265	52	17	Chronic nephritis.	A loud, harsh, and blowing presystolic murmur is heard—not transmitted.
III.	277	60	15	Chronic diffuse nephritis.	Systolic murmur at apex.
IV.	274	3	2	General miliary tuberculosis.	Systolic murmur at apex.
V.	144	39	22	Thrombosis.	Systolic murmur at apex.
V.	37	39	.....	Aneurism of aorta.	Systolic murmur at apex.
III.	261	40	11	Ulcerative colitis.	Systolic murmur at apex.
II.	567	59	7	Cancer.	Systolic murmur at apex.
II.	380	31	.....	Acute pericarditis.	Systolic murmur at apex.
IV.	65	5	2⅓	General miliary tuberculosis.	Systolic murmur at apex.
III.	39	55	11	Cirrhosis of liver.	Systolic murmur at apex.
IV.	98	56	14	General miliary tuberculosis.	Systolic murmur at apex.
IV.	66	24	9⅓	Pleurisy with effusion.	Systolic murmur at apex.
II.	570	46	13	Ulcer of stomach.	Systolic murmur at apex.
III.	106	.....	9	Phthisis.	Systolic murmur at apex.
III.	43	.....	11⅓	Phthisis.	Systolic murmur at the apex transmitted into the axilla.
IV.	52	51	21	Chronic nephritis.	Systolic murmur transmitted to the axilla. Some accentuation of the aortic second sound.
II.	324	.....	8⅓	Pernicious malaria.	Hæmic bruit heard at the apex.
V.	231	41	21⅓	Chronic nephritis.	Systolic murmur at apex loud and blowing, transmitted into axilla, heard up along sternum to third left rib. Accentuation of pulmonic second sound.
II.	468	19	14	Acute lobar pneumonia.	There is a systolic murmur heard at the apex and transmitted upward and to the right and not into the axilla.

Murmurs at Base and Apex.

II.	310	65	17⅓	Lobar pneumonia.	Over base in aortic and pulmonary areas a soft systolic murmur is heard.
V.	196	35	8	Ulcer of rectum.	Slight roughening of first sound at the apex. Short faint systolic murmur over pulmonary area. Some accentuation of pulmonic second sound.
IV.	257	60	11	Emphysema.	Systolic murmur at apex and base.
II.	432	32	18	Chronic diffuse nephritis.	A double murmur can be heard at base and apex. It is faint and blowing.
V.	36	36	9	Chronic diffuse nephritis.	Rather a harsh systolic murmur, heard loudest over apex and pulmonary area.
IV.	40	26	6½	Septic peritonitis.	Soft blowing systolic murmur at apex transmitted into axilla. Soft blowing systolic murmur loudest in second left interspace transmitted into the neck.
V.	223	20	14	Cerebral hemorrhage.	Systolic murmur at apex and one at base.
III.	258	47	13	Chronic diffuse nephritis.	A harsh blowing systolic murmur at apex and to left of sternum at the base.
III.	19	49	21	Chronic diffuse nephritis.	At apex transmitted to axilla and heard in the back is a blowing systolic murmur. Double murmur at the base.
III.	238	47	11⅓	Cancer.	Systolic murmur at apex transmitted into axilla. Faint murmur with second sound at base to left of the sternum.
III.	253	29	13	Chronic diffuse nephritis.	Systolic murmur at apex and base to right of sternum, and a reduplication of the second sound.
V.	93	41	21	General endarteritis, chronic nephritis.	Systolic murmur at apex, transmitted a short distance to the left. Systolic murmur at the base loudest in the second right interspace. Very marked accentuation of the aortic second sound.
V.	183	24	16	Chronic diffuse nephritis.	Faint systolic murmur over the pulmonary area. Roughening of and slight reduplication of the first sound at the apex. Marked accentuation of second aortic sound at the base.
II.	261	46	15⅓	Chronic nephritis.	A feeble mitral systolic bruit is heard. Some roughening of aortic sounds. Slight carotid pulsation marked.

Murmurs at Base and Apex.—Continued.

Book.	Page.	Age.	Weight of Heart.	Disease.	Murmurs.
			Ounces.		
IV.	13	24	9½	Thrombosis of iliac vein.	Systolic murmur at the apex—soft, blowing in character and not transmitted. In the second left intercostal space, heard also over left fourth cartilage, a somewhat louder but soft blowing systolic murmur—it is heard also over vessels of neck on both sides. Higher up in neck, just below angle of jaw, is a murmur heard with the second sound.
II.	96	43	12	Cancer of stomach.	Faint systolic murmur at the apex not transmitted. At base a faint murmur with both sounds, probably all hæmic.
V.	94	30	10⅓	Acute lobar pneumonia.	Faint systolic murmur at the apex; also a faint systolic murmur over pulmonary area.
V.	100	35	8	General endarteritis, chronic myocarditis.	Systolic thrill marked over apex. Systolic murmur over mitral area transmitted to the left a short distance. Faint systolic murmur over the pulmonary area. Accentuation of the pulmonic second sound.
V.	78	57	.....	Cancer of pylorus.	Soft short circumscribed systolic murmur at apex; the same kind, but a different murmur, over both valves at the base. Moderately loud venous hum in the neck.
II.	527	23	16	Puerperal sepsis.	At apex and transmitted upward is a presystolic murmur. Over base and loudest at pulmonary valve is a murmur with the first sound.
V.	49	48	12½	Acute lobar pneumonia, chronic nephritis.	At apex is a blowing systolic murmur transmitted to axilla. At base a double murmur. The diastolic murmur being transmitted up and down the sternum.
IV.	23	32	13	Cirrhosis of liver.	Faint systolic murmur at apex and in second left space.
II.	465	36	14	Pneumonia.	A murmur with second sound at apex and base.
II.	255	35	.....	Pyophlebitis.	Aortic, indirect, and mitral systolic murmurs are heard.
II.	260	57	22½	Stricture of pylorus.	A mitral systolic murmur, well marked and transmitted, is heard, also a double aortic murmur.
II.	235	34	5⅓	Cancer of stomach.	Two systolic bruits are heard, one transmitted to the axilla, the other to the neck—both being regular.
V.	222	28	12	Pernicious anæmia.	Loud systolic murmur over base, loudest over second left interspace and along left edge of sternum to tip. Marked accentuation of pulmonic second sound. Systolic murmur over the mitral area. At one point directly over nipple a double murmur is distinctly appreciable. There is a systolic thrill over the mitral area.
IV.	140	22	9	Phthisis.	At apex a faint systolic murmur. At second left space and over sternum a blowing systolic murmur and marked roughening of the second sound. A visible pulsation in second left space close to the sternum.
					Musical Murmurs.
III.	236	55	16	Emphysema.	Below the xiphoid cartilage and feebly in the right intercostal space is heard a systolic murmur and a presystolic sound.
IV.	145	.....	14	Chronic diffuse nephritis.	A rough systolic murmur heard all over the præcordium, loudest at ensiform and second costo-sternal junction and well marked at apex. Systolic thrill at apex.
IV.	1 0	23	10	Puerperal septicæmia.	Systolic murmur over ensiform and fourth left intercostal space.
IV.	191	48	20⅓	Chronic diffuse nephritis.	Second sound at apex reduplicated. Sounds loudest over ensiform and to left. Here there is a rough murmur with the second sound. First sound not heard at base.
IV.	173	50	17	Chronic diffuse nephritis.	Systolic murmur transmitted into axilla. Diastolic murmur heard loudest at ensiform.
IV.	252	23	6¾	Phthisis	Prolongation of first sound at apex. Accentuation and roughening of pulmonic second sound. Systolic murmur heard at junction of right fifth rib and sternum.
IV.	105	40	10	Cancer of liver.	Faint systolic murmur. Systolic murmur at base transmitted into neck. A more intense one at ensiform transmitted to the right. Second sound accentuated.
IV.	242	51	27	Chronic diffuse nephritis.	Musical systolic murmur heard up the sternum and into axilla. Systolic murmur over both breast-walls of a blowing character. Aortic second sound markedly exaggerated.

Murmurs where the Valves Show only Atheroma or Calcification.

				Lesion.	Murmurs.
IV.	262	76	17	Mitral valve has calcareous deposits at base.	Blowing systolic murmur at apex not transmitted.
IV.	141	. . ..	8	Aortic valve, some calcareous deposits on valve.	Systolic murmur at apex transmitted into axilla.
II.	252	.....	17	Aortic valve, calcareous plates. Mitral valve, calcareous plates on the valve.	Mitral systolic murmur.
V.	181	.....	14	Mitral valve, yellowish placques on the valve.	Faint systolic murmur at base heard loudest in second right interspace near sternum.
V.	43	.....	17	Aortic valve, some calcareous matter on the valve.	Systolic murmur over the aortic area. Systolic murmur at apex transmitted to the left.
IV.	54	74	13	Aortic valve, some atheroma of the valve. Mitral valve is atheromatous.	Soft systolic murmur.
IV.	214	63	11	Aortic valve, calcareous plates at orifice. Mitral valve, calcareous plates at the orifice.	Systolic murmur at the apex.

Roughening of the Sounds.

IV.	95	44	8½	Otitis media.	First sound at apex accentuated and is of a rough quality.
III.	112	47	.....	Chronic nephritis.	Roughening of base sounds. Most marked at base.
IV.	30	32	9	Chronic pulmonary tuberculosis.	Rough first sound at apex. Accentuation of second at base.
V.	219	58	13	Cerebral hemorrhage.	Slight roughening of first sound at apex. Some accentuation or aortic second sound at base.
III.	145	26	7	Chronic pulmonary tuberculosis.	Roughening of second sound at base.
IV.	108	24	9	General miliary tuberculosis.	Roughening of first sound at the base.
II.	418	.....	.....	Gun-shot wound.	Slight roughening of mitral first sound.
III.	65	.....	16½	Chronic nephritis.	At apex a roughening with first sound.
II.	350	50	10½	Tubercular meningitis.	First sound roughened at the apex.
II.	181	30	8	Addison's disease.	Roughness of second sound at the base and conducted down the right side of heart.
II.	516	44	9	Chronic pulmonary tuberculosis.	Roughening of both sounds at the base.

SUMMARY.

TABLE I.

Valvular Lesions and Endocardial Murmurs	138
A. Lesions of the aortic valve alone	33
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B. Lesions of the mitral valve alone	27
With murmurs at the base	6
With murmurs at the apex	15
With murmurs at the base and apex	6
C. Lesions of both aortic and mitral valves	59
With murmurs at the base	3
With murmurs at the apex	25
With murmurs at the base and apex	31
D. Tricuspid valve affected	15
E. Pulmonary valve affected	1
F. With incomplete septa	3

TABLE II.

Valvular Lesions without Murmurs	83
A. Slight thickening or atheroma of valves	38
Aortic	11
Mitral	19
Aortic and mitral	7
Aortic, mitral, and tricuspid	1
B. Greater changes in the valves	45
Aortic	12
Mitral	14
Aortic and mitral	12
Other valves affected	5
With other lesions	2

TABLE III.

Murmurs without Valvular Lesions	120
Murmurs at the base	32
Murmurs at the apex	34
Murmurs at the base and apex	28
Musical murmurs	8
Murmurs with but slight change in the valves	7
Roughening of the sounds	11
Heart with Normal Valve and no Murmurs	379

XXI.

A REPORT OF TWENTY CASES OF PENETRATING BULLET-WOUND OF THE CHEST.

By Andrew J. McCosh, M.D.

During the past twelve and a half years (July, 1887, to December, 1899) there have been treated under my care in the hospital twenty cases of penetrating bullet-wound of the chest. In the other surgical division, under the care of Dr. Briddon, there have been treated presumably an equal number, but these are not reported in this paper. In the consideration of these cases it should be borne in mind that the wounds were made by the so-called large calibre weapon, the modern penetrating small-bore not having been employed. Eighteen of the patients were wounded by a bullet shot from a pistol, one from a rifle, and in one the weapon was unknown. With two exceptions the shot was fired at very close quarters.

Of the 20 cases there were 19 males and 1 female.

The ages varied from thirteen to fifty-two.

Mortality.—Six died and 14 recovered, a mortality of thirty per cent. Of the fatal cases 2 died from shock and 4 from pneumonia. In the 2 patients who died from shock (Cases 5 and 20) the damage done by the bullet was not confined to the thoracic organs; in one (Case 5) the heart, spleen, and liver being wounded, and in the other (Case 20) the left kidney. It can be stated, therefore, that there were no deaths from shock among the eighteen cases of penetrating bullet-wound of the chest.

Symptoms.—Evidences of severe shock were noted in 6 patients. In 2 of these, however, mentioned above as resulting in death, the determining cause of the fatal result was apparently the injury done to organs outside the thoracic cavity. The shock was noted as considerable in 8. No mention was made of shock in the history of 6 of the patients.

Of the 18 who survived the shock of the accident a distinct pneu-

monia developed in 8, terminating in death in 4, on respectively the fourth, fifth, eighth, and tenth days, and in recovery in 4.

In one case (Case 14) a localized abscess of the lung followed the pneumonia. This was mainly discharged through the bronchus and the patient recovered. (See history which follows.)

Bloody expectoration followed the injury in 14 of the cases, varying from slight to profuse and appearing in some on the first day only, in others at a later date, and in one patient (Case 14) beginning on the eighth day and continuing for thirty-four days. This patient recovered.

In Case 19 a perforation of the œsophagus complicated the pulmonary wound. The œsophageal fistula remained open for nine days. The patient recovered.

In the other cases an area of consolidation around the bullet-track was noted. Of course this might be termed a localized pneumonia. In regard to the question of alcoholic habit the histories are deficient, but mention of such a habit is made in 6 of the cases. Of these only 1 died, the cause of death being pneumonia.

Of the 14 patients who recovered the average time in bed was 11½ days, the shortest being 3 and the longest 27 days. The average time in the hospital was 21½ days.

The following history is of interest on account of the abscess which formed around the bullet.

Case 14.—F. D. J., aged forty-one; a man of good health and habits; a moderate drinker. While hanging out a flag in the front window on the 4th of July, 1896, he was struck in the right chest by a bullet from an unknown source. He experienced some shock, but was able to walk one-eighth of a mile to his doctor's office. The latter probed the wound but was unable to locate the bullet. The patient returned to his home, walking the same distance, thence was brought by ambulance to the hospital.

On admission he was suffering from shock, pain, and dyspnœa. On examination a bullet wound (that of entrance) was seen an inch and a half below the junction of the external and middle thirds of the right clavicle.

A probe was gently passed down to the pleura. There was an extensive subcutaneous emphysema in the right axillary region. There was almost complete absence of respiratory sounds over the whole of the posterior part of the right chest and of the upper part in the

No., Name and Date.	Age, Sex and Occupation.	Habits.	Family History.	Personal History.	Weapon.	Effect at Moment.	Condition on Admission.
1, A, W., July 6, 1887	24, m., laborer.....	Good	Good	Good.	Revolver.	.....	Severe shock; severe pain; severe dyspnœa.
2, E. W., July 20, 1887.....	39, f., housewife.....	Opium habit, non-alcoholic.	Good.. ...	.....	Revolver.	.....	Considerable shock; considerable pain; considerable dyspnœa.
3, T. R., June 21, 1888	22, m., butcher.....	Alcoholic.....	Tubercular.	.....	Revolver.	.....	Considerable shock; considerable dyspnœa; slight pain.
4, J. K., August 16, 1888....	25, m., weaver	Good	Good	Good.	Revolver.	Unconscious.	Severe shock; unconscious; left hemiplegia and anæsthesia.
5, J. Z., April 18, 1890	34, m., merchant.....	.....	.....	.....	Pistol.. .	.....	Severe shock; much bloody expectoration.
6, I. S., July 24, 1890.....	31, m., baker.....	Good	Good	Good.	Rifle.....	Slight pain and dyspnœa.	.....
7, J. H., July 30, 1890.....	21, m., horse dealer...	Alcoholic.....	Good	.....	Pistol....	.....	Considerable shock and dyspnœa.
8, M. M., August 31, 1890 ..	43, m., physician.....	Alcoholic	Good	.....	Pistol....	.....	Severe shock and dyspnœa.
9, F. H., May 31, 1891. ...	52, m., book-keeper...	Alcoholic	Good	.....	Pistol....	.....	Considerable shock; pain, and dyspnœa.
10, W. F., August 18, 1891...	25, m., clerk	Good	Tubercular.	.....	Pistol....	.....	Slight shock.....
11, J. A., April 13, 1892.....	20, m., carpenter. ...	Good	Good	.....	Pistol....	....	.....
12, F. H., January 1, 1893 ...	13, m.....	Good	Good	... ..	Pistol....	.....	... .
13, J. T., February 27, 1895..	43, m., laborer	Alcoholic.....	Good	.....	Revolver.	.....	Considerable shock and dyspnœa.
14, F. D. J., July 4, 1896	41, m.....	Slightly alcoholic.	Good.. ...	.....	Unknown	Able to walk one-quarter mile.	Considerable shock; pain and dyspnœa.
15, L. K., March 15, 1898....	27, m., button-maker .	.....	.....	.....	Pistol....	Walked half mile to hosp.	Considerable shock; pain and dyspnœa.
16, P. C., April 14, 1898.	28, m., marble cutter..	Slightly alcoholic.	.....	.....	Pistol....	.....	.....
17, M. C., November 12, 1898	30, m., soldier.....	.....	.....	.....	Pistol....	Unconscious for few minutes.	.....
18, G. S., April 18, 1899	48, m., mason.... ..	.....	.....	.....	Pistol....	.....	Severe shock... .....
19, W. K., June 5, 1899.....	26, m., butcher.....	.....	.....	.....	Pistol....	....	Considerable shock; pain and dyspnœa.
20, C. H., September 28, 1899.	48, m., barber.....	....	.. ..	.....	Pistol....	.....	Extreme shock; dyspnœa.

Wounds.	Physical Examination.	Bloody Expectoration.	Complications.	Treatment.	Time in Bed.	Time in Hospital.	Result.
In third intercostal space, 1 inch inside of mammary line; to left of heart.	Moist râles over left lung.	Slight amount.	Small area consolidation, left lung.	Ice bag and cold applications.	19 days....	21 days....	Cured.
In back, 4 inches to left of spine, penetrating scapula.	Numerous moist râles over left lung.	Considerable.	Small consolidated area.	Ice bag and cold applications.	9 days.....	12 days ...	Cured.
Sixth intercostal space, 1 inch internal to mammary line.	.. ..	Small amount.	Small area consolidation.	.....	13 days....	78 days....	Cured.
Fourth intercostal space, left chest, ½ inch internal to mammary line.	.....	Yes.....	Pneumonia; pneumothorax.	Ice bag.	10 days....	10 days....	Died.
Entrance 1 inch below left nipple and ¼ inch external; exit ½ inch to left of transverse process, eleventh dorsal vertebra.	Respiratory sounds absent over base left lung.	Profuse	.....	Dry heat; stimulation; morphine; chest aspirated.	1 day.....	1 day.....	Died; penetrating wound left lung, pericardium, heart, spleen and liver.
Ninth intercostal space, right side, 1 inch below angle of scapula.	.....	Yes.....	Slight area consolidation.	Ice bag.....	3 days.....	5 days	Cured.
Fourth intercostal space to left of sternum.	Area of cardiac dulness markedly increased; amphoric breathing.	Profuse.....	Pneumonia. ...	Ice bag and cold applications.	11 days....	14 days....	Cured.
.....	.....	Yes.....	Pneumonia.....	....	4 days.....	4 days.....	Died.
One and a half inch below left nipple and 3 inches to left of median line; bullet felt under skin at tenth rib in mid-axillary line.	.....	Considerable on fourth day.	Small area of consolidation.	Ice bag and cold applications.	10 days....	14 days....	Cured.
Fourth intercostal space, left side, midway between nipple and xiphoid cartilage.	.....	None.....	Small area of consolidation.	Ice bag.....	4 days.....	6 days.....	Cured.
In mammary, midway between nipple and clavicle.	.....	.....	Small area of consolidation.	Ice bag.....	.....	9 days.....	Cured.
Fifth intercostal space, right side, 1 inch to right of sternum.	.....	.....	Pneumonia.....	....	27 days....	36 days....	Cured.
Fifth intercostal space, right side, just to left of nipple.	Râles over right chest.	Considerable..	Pneumonia	... .	15 days ...	23 days....	Cured.
One inch and a half below right clavicle, junction outer and middle thirds.	Almost complete absence respiratory sounds over right chest; emphysema.	Began on 8th day and continued 34 days.	Area of consolidation followed by abscess of lung.	.....	9 days.....	43 days....	Cured.
Third left intercostal space..	.....	.....	Slight area of consolidation	.. ..	13 days....	17 days....	Cured.
Second left intercostal space; line of nipple.	....	Slight on 2d day.	Considerable area of consolidation; delirium tremens.	.....	10 days....	16 days...	Cured.
Sixth left intercostal space, 4¾ inches from median line.	.....	.....	Pneumonia. ...	.....	8 days.....	8 days.....	Died.
Third left intercostal space..	.....	.....	Pneumonia.....	.....	5 days.....	5 days.....	Died.
Left chondro-sternal junction.	.....	.. ..	Perforation of œsophagus.	.....	9 days.....	11 days....	Cured.
Tenth space, mammary line.	....	.....	Bloody urine...	....	27 hours. ..	27 hours ...	Died.

axillary region. There was a slight cough. Temperature, 100½° F.; pulse, 110; respiration, 30.

For two days he suffered considerable pain, especially on coughing. The sputum was not blood-stained and consisted mainly of mucus; he then became quite comfortable, his cough decreasing, and on July 12th he was able to sit up in a chair. During this time his temperature had varied from 99° to 101° F. On July 13th he began to feel pain in his right side, and his expectoration became slightly blood-stained, signs of consolidation appearing in the upper lobe of the right lung and over the middle lobe posteriorly. July 14th the area of consolidation was somewhat larger and involved the greater part of the middle lobe, apparently around the bullet. (See plate, opposite.)

His temperature from July 12th to the 19th varied between 99° and 102° F.; pulse, 100 to 110; respiration, 28 to 32. The amount of expectoration increased and continued slightly blood-stained. On July 20th there was a sudden explosive cough and he expectorated four to five ounces of pus mixed with blood. Until July 25th the expectoration, consisting of blood and pus, continued in considerable quantity, causing him great discomfort. His temperature varied, during this time, between 100° and 103° F. July 26th the area of consolidation began to diminish and there were signs of a cavity in the middle lobe, appearing to be about two to three inches in diameter. The blood-stained expectoration with occasional bad odor continued until August 1st, but his temperature began to decrease, and after August 6th remained under 100° F. His expectoration continued to diminish in quantity, his temperature gradually became normal, and he was discharged from the hospital August 17th.

Since that time he has remained perfectly well and has had no inconvenience whatever from the bullet, which, as will be seen from the photograph, lies in the upper part of the middle lobe of the right lung. With the fluoroscope there can be seen around the bullet an irregular area, where there is a faint shadow about two and a half inches in diameter.

The following case, which ended fatally, is of interest because of the erratic course of the bullet.

J. Z., April 19, 1890. At the post-mortem examination the wound of entrance was found one inch below the left nipple. The bullet had passed through the fifth intercostal space, one inch to the

View from Back Showing Bullet in Middle Lobe of Right Lung.

left of the sterno-costal articulation of the left side, passing inward, downward, and backward. It notched the edge of the anterior lip of the upper lobe of the left lung. It passed through the pericardium, grazing the apex of the left ventricle, cutting half through its wall. It emerged from the pericardium, penetrated the diaphragm, grazed the margin of the liver, and passed through the walls of the stomach, notching the pancreas near its tail. It was then deflected upward, perforating the diaphragm, and re-entering the pleural cavity emerged one inch to the left of the spine of the eleventh dorsal vertebra, where it lodged.

Treatment.—The results in the cases where ice-bags and cold applications were systematically employed seem to have been distinctly better than in cases where this treatment was either omitted or was less carefully carried out. In this connection, however, it should be mentioned that the best results were obtained before the enlargement of the hospital, and where perhaps the patients received more attention than has been given them since the service has become so active.

The shock was of course always treated by stimulation and the pain controlled by anodynes.

Many of these patients have been seen since their discharge from the hospital, and as far as is known no permanent bad effects have followed the injury to the lung.

XXII.

RECORDING AND CLASSIFYING SURGICAL HISTORIES.

By Forbes Hawkes, M.D.,
SURGICAL REGISTRAR TO THE HOSPITAL.

THERE is one department of hospital work, and a very important one, which has received but little attention in this country except in some of the larger hospitals of our cities. I refer to the systematic recording and classifying of patients' "histories."

I. THE PATIENT'S "HISTORY."

A systematic record should be taken of every patient obtaining admission to a hospital and receiving treatment there. This record or "hospital history" is undertaken by the historian, usually a member of the resident staff. It should embody, in a general way, the following: The statements elicited from the patient as to age, occupation, civil condition, nationality, as to the occurrence of previous ailments (where and how treated), as to present troubles and facts liable to have a bearing on these troubles (such as the presence of certain disorders in parents or in other members of the family); the description of the lesions found when the patient is admitted to the hospital; a minute account of the conditions for which treatment is undertaken; in surgical cases the workings of lungs, heart, and kidneys before operation, together with the condition of the vascular system; a painstaking description of the operation (if there has been one) and the post-operative behavior of the patient, both as to general condition and local lesion; and a statement as to results of treatment at the time of departure from the hospital.

Patience, perseverance, and tact on the part of the historian are often needed to obtain the necessary information from the patient or friends; a methodical manner in the questions and in the examination of the patients as well as in the way of recording the same is

of great assistance both to surgeon and to historian. With regard to the record of the operation it should be written with two ideas in view ; in the first place it should give in detail every point of operative procedure, such as position of patient, exact location of incision, a recital of the various structures exposed or divided in the wound, and their condition as seen at this time, the amount of hemorrhage and the means adopted for its arrest, the composition of the ligatures and sutures used (in the case of unabsorbable ones, silk, silk-worm gut, their number and where placed), the lesion as brought to light by the operator (a very important part of the history), the exact means employed in dealing with it, and the remaining steps in the operation, including material used for dressings. The anæsthetic used, its approximate amount and behavior of patient during anæsthesia and the time consumed in the operation should also be recorded.

In the second place special attention should be paid by the historian during the operation to those conditions encountered by the operator which may be of unusual interest, and such facts should be incorporated with the others above mentioned in the description of the operation.

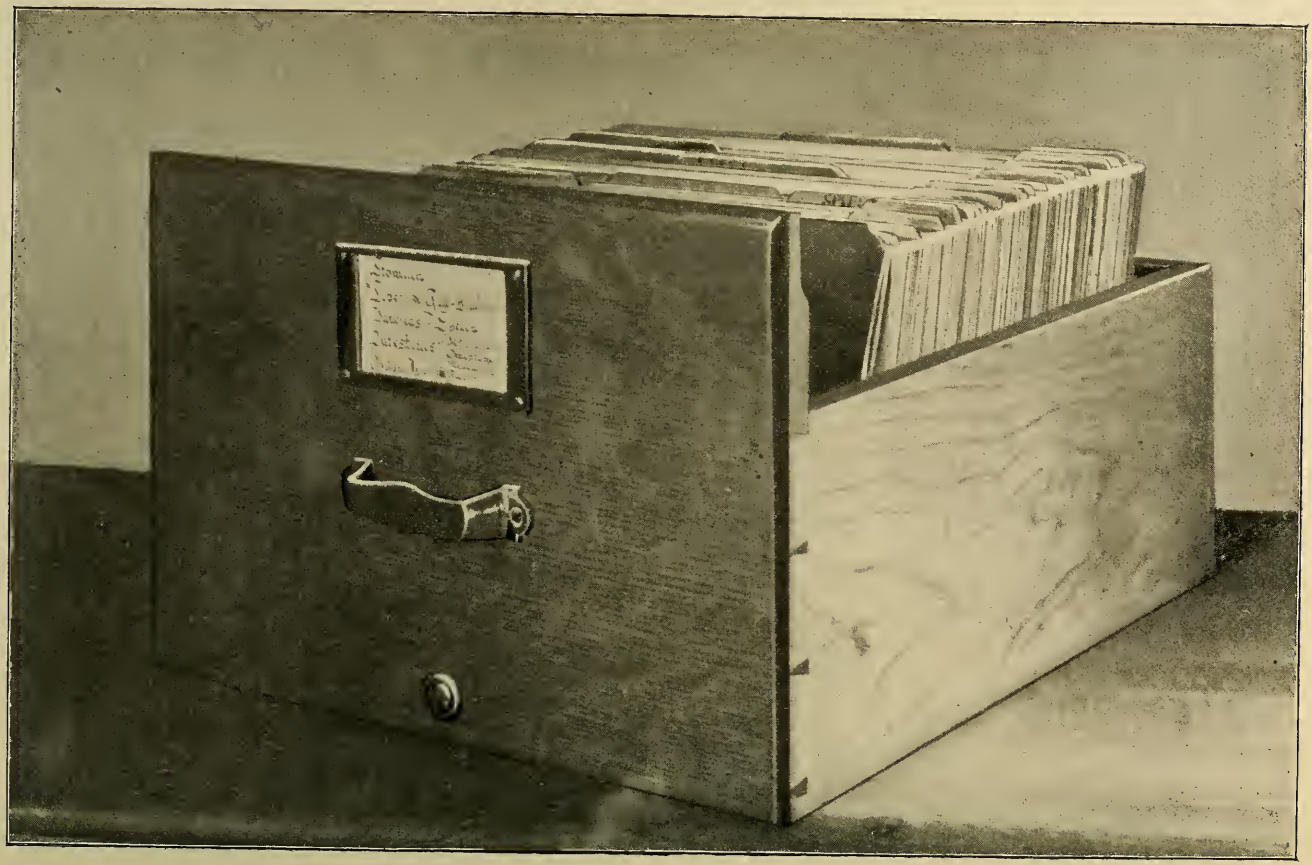
It is pertinent here to say that the first assistant or house-surgeon in a large hospital does not as a rule write the record of the operation (his other work occupying his time). The operator therefore who accustoms himself to mention during his operation the various anatomical structures as he finds them, who describes the lesions exposed and who informs his operating staff of the salient points in his operative technique as they occur, has a right to expect a better record from his historian than he who relies entirely upon the keenness of the historian's vision ; for this may often be impaired by the fact that he has to lean over some one's shoulder in order to obtain a satisfactory view of the operation, and that he may be busy at the same time in threading a needle or passing an instrument required. Where other important parts are seen, as they often are, by the operator during the course of the operation, their normal or abnormal condition as noted at such time should be recorded by the historian. If during an operation cultures are made, or fluid removed for examination, this should also be recorded.

It has been suggested that records of operation should be kept by a stenographer from the dictation of the operator. Such

records are certainly valuable for the operator's private notes, but should it become the rule to incorporate such notes in the hospital "histories" as the record of the operation the attention of the assistant whose duty it would otherwise be to record these facts would certainly be lessened thereby, and his experience therefrom, both in the way of knowledge obtained of existing pathological conditions and in the way of facility of style acquired from the recording of these conditions would be of far less value to him—an important consideration.

The general post-operative history should include on the part of the nursing staff the records of the patient's temperature and of the rate and character of pulse and breathing, while the historian adds such notes as to change of dressings, condition of wound, and other data as have a bearing on the behavior of the wound or local lesion and on the patient's general condition. A wide divergence of opinion we may say exists on the part of various historians as to what should be recorded in a surgical history after an operation. While it is not essential that the minutiæ of the patient's ward life and of the medication should be recorded in every case, still such minutiæ are of interest to the surgeon on daily rounds and may well possess scientific value at some later time. For this reason the methods now employed at the hospital are those whereby these records, written by the nurses, form a part of the patient's history, and to them are added such notes as to local condition of wound, frequency of dressings, etc., as are dictated by the dresser. The dates when the patient is allowed to sit up and to get out of bed are recorded, and notes finally made as to the local and general condition when the patient is discharged from the hospital.

Appended to the history should be the signed record of the pathologist as to the microscopical findings or cultures when such have been made. A record of those facts that apply to an individual patient may be said to constitute this patient's "history," and such a record should be so made as to be of value for two distinct purposes: First, That the hospital may have a complete record of the patient's lesion and of the treatment he received for reference at any time. Second, That the operator may have available a scientific record of this patient sufficiently complete to be of value in the compilation of more or less similar cases for publication.



Drawer with Cards.

ONE OF THE CABINETS WITH THE DRAWERS.

II. CLASSIFICATION OF THE HISTORIES.

It is a matter of considerable importance in a hospital which treats thousands of patients each year that the histories of the patients should be so arranged that two requirements are fulfilled.

First, That the history of any patient can be found in its proper place with the least amount of time and trouble.

Second, That the histories of all similar or analogous cases for a number of years be grouped together so that the surgeon who is desirous of compiling data and of recording his methods and results in a number of such cases extending over several years (and the more valuable on this account) can have all such histories together, arranged before him in their proper order for reference.

While the system of recording the histories of patients on proper sheets which are then bound together has much to recommend it, still it is easy to see that the mere handling of from eight to ten volumes for each year in the search for the similar cases will consume much time even if the references to pages be at hand; on this account principally the method now in use at the Presbyterian Hospital on the Surgical division was adopted. It may be said to have met all requirements satisfactorily. It is as follows: The histories, bedside notes, temperature, pulse, and respiration readings are all kept on cards of a uniform size, which are filed on rods in suitable drawers in such a way as to be easily consulted. At the top of the first card will be found the patient's name and diagnosis, as well as the date of his admission and discharge. The surgical diseases are arranged regionally, that is, according to the region of the body in which they occur. In any region those diseases which occupy the superficial structures (skin, fat) are grouped together first, then come those occupying the deeper parts, and finally those of the bony framework and its contents; in addition all similar lesions of the same parts which are of common occurrence (such as tubercular glands of the neck, strictures of the urethra, abscesses of the ischio-rectal region, all the fibroid tumors of the uterus, etc., etc.) are arranged together in their own subdivision according to the date of their discharge from the hospital. These divisions and subdivisions have each their proper designating "guide-cards," so that they may be turned to in an instant and found all together in their proper drawers. In addition "date cards" are interposed at inter-

vals, giving the years and months, making the search still easier. The only exception to the general regional classification in this system which it has seemed wise to make is that of a separate grouping together of all the "Fractures and Dislocations." These are, however, all arranged in an absolutely similar manner according to regional distribution.

It has seemed to the writer that a representation of a "History card," of a "Bed-side Note-card," and of a "Temperature, Pulse, and Respiration Chart-card"* would give a clear idea of each, and that a view of the cabinets in which such cards are filed and of the arrangements in each drawer would be of interest.

To refer rapidly in this system to the card of any patient who has been treated on the Surgical side of the Hospital it is simply necessary to know the patient's diagnosis and the date of discharge, both of which are readily found in the alphabetical "Index of Patients" of the Hospital.

Changes are not usually undertaken unless existing conditions are unsatisfactory. This article has been written with the hope that it may serve as a working basis for a system which can be used in other hospitals where the members of the staff are desirous of saving time and trouble, either in searching for an individual case or in collecting statistics concerning all the similar cases treated over a period of several years.

If there be several attending surgeons the histories of the patients in the various services may be recorded on cards of different tints—a further simplification and help.

* For illustrations see following pages.

Dr. Briddon — Attending S — Admitted February 21 1899

Dr. Dorsey — House S — Discharged March 25 1899

cured.

Diagnosis Incarcerated Inguinal Hernia, Operation. Radical cure [Halsted]

69. M. U-S. Porter

Family History negative.

Previous Personal History: moderately alcoholic; Otherwise negative.

Present Trouble: About 20 years ago while lifting a heavy weight he had a severe pain in the left groin and says he felt something "give way". This caused him no inconvenience but a few months afterwards he noticed a small tumor in the L. inguinal region. He was told this was a rupture and since then he has worn a truss. Notwithstanding this however the tumor has gradually increased in size Up to 2 weeks ago it had not affected his health and he could always replace the lump. He caught cold at that time and since then has had a cough and has been unable to get the tumor back - He has had much pain in it. He has had no vomiting but has been much constipated

Physical Examination: Heart - negative, Lungs: Some emphysema. Radial artery a little thick.

Urine 1020 { no albumen. no sugar. microscopical: negative

There is an irreducible tumor occupying Inguinal region and extending into Scrotum. Dull below, tympanitic above. Somewhat tender, Skin not inflamed.

Operation Feb 22/99. 2.30 PM. Dr C.K. Briddon. Ether anoesthesia. An incision three inches long was

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Presbyterian Hospital — Bedside Notes — Name — Ward VIII

Date	Hr.	Medication	Urine	Dej.	Remarks	Day
February 21st '99	4 PM	Pulv. Glyc. Co ℥ij · Prepare for operation	℥x	ij	Patient a little restless. Urine sent to Laboratory	
" 22nd	8 am				In good condition. Went to operating pavillion at 2.15 PM returned at 3.45 PM. Restless & noisy in the evening. Quiet after medication. Stimulating enema expelled with some foecal matter	1
	4.40 PM.	Enema ♁ ss Spt. Terebinth ℥ij fl. Salt Sol ℥ij				
	9 PM.	Hypo. Magendies sol. mlx.				
" 23rd		Allow Fluids with milk			Complains of only slight pain in the neighborhood of the wound. No nausea. No vomiting. Pulse is a little high tension. Relieved by medication. Urine to Laboratory	2
	2 am		℥viij			
	9 am	Hypo. Nitroglycerine gr 1/100				
	10 am		℥vi		Fluids ℥xxx	
			℥xi		Urine 1030. negative.	
" 24th		Total for 24 hours	℥xxv		Patient had a fairly comfortable night. Some gas expelled by rectum. Does not Complain of wound	3.
					Fluids ℥xl	
" 25	1 am	Codeia gr 1/6 Total for 24 hours	℥xxx		Restless early part of evening. Relieved by medication	4.
	7 am	Calomel gr 1/10 q.1.h. for 10 doses. followed by			Mistura X started 7 am	
	6 PM	Seidlitz powder No i s.o.s.				
	8 PM	Enema s.o.s.		i	Enema gave excellent result.	
" 26		Light diet			Patient had excellent night. Complains of dressing being "dry". Dressing by House S. Wound looks well. No suppn.	5
				i		
" 27					Patient Comfortable.	6.

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"Bedside Notes" Card.

Temperature Chart with Pulse and Respiration Readings.